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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. SEPTEMBER 28, 1899. CHICAGO, ILL. NUMBER 39

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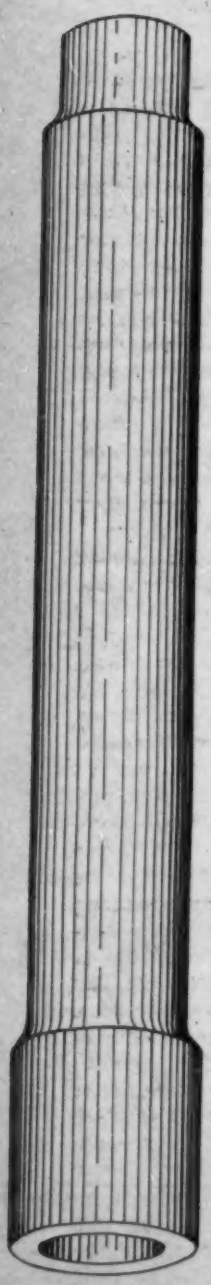

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. SEPTEMBER 28, 1899. CHICAGO, ILL. NUMBER 39

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Convictions that prices of iron and steel are too high do not as yet have any deterrent effect; nor do opinions as to what may happen by the middle of 1900 prevent such a demand as still gives the market an advancing tendency, particularly in primary products. Buyers of foundry iron are still willingly paying the prices named from week to week on deliveries that reach nine to twelve months ahead, but there are some demurrers in finished lines, by buyers who cannot see how they can maintain their wonted volume of sales at the prices they must ask, based on to-day's values for their iron and steel requirements. Yet with all the reasons that can be given for stopping the upward movement and in spite of the evident holding up of contracts because of excessive cost, business is yet so abundant as to push steadily forward the day of decline from the high level. One and two months back speculation was busy with the probable basis of billet contracts for the first half of next year. It was generally considered that it would be considerably below the well-nigh famine price for billets established on small lots for early delivery. But as transactions for 1900 come up, these calculations prove to be quite astray. Instead of the $30 price talked of, there have been sales of sheet bars at $36, Central Western mill, and Bessemer billets have been sold at $38, delivery in 1900, as against $22 to $25 done some months ago on billet and sheet bar contracts for the second half of this year. With steel bars at $50 net ton for next year, rails at $33, and structural shapes at $45, it is evident that, as has been the case throughout the upward movement, the producer of billets, slabs and sheet bars will continue to have relatively better profits than the manufacturers of finished material. Steel works have shown their faith in the continuance far into next year of the present basis by paying the equivalent of $24 Pittsburg for Bessemer pig iron in the past ten days, and in spite of the three additional Bessemer furnaces that will be in blast in the first half of 1900 steel manufacturers seem to be convinced that a $23.25 price at valley furnace for the relatively small amount of Bessemer iron for which they go into the market, is warranted by the outlook for finished material. Southern irons have advanced from 50 cents to $1 in the week, and while buying has not been up to the pace of August it is still strong and confident. Car scarcity in the South is adding to the troubles of foundrymen and furnacemen, and the shortage of cars in the Connellsville region is still holding down pig iron production in the Mahoning and Shenango valleys. Forge iron in the valleys is approaching a famine condition, and it is found that with all the puddling furnaces in the country in full operation, the demand for iron products, in view of the scarcity of steel, is getting beyond the available supply of primary materials. The rail situation for 1900 has developed enough to indicate that the $33 basis is not a serious barrier to business in the present prosperous condition of the railroads and their need of better and greater facilities. Purchases aggregating 50,000 tons are reported in the week by Western lines from mills west of Chicago, with an additional tonnage placed in the Chicago district. There has been heavy contracting of late for bars, iron and steel, and mills are already well sold for several months into 1900. English market reports continue to refer to inquiry from the United States, though relatively of small amount. The market for hematite iron at Barrow is reported firmer at 76 shillings, because of buying for American account. A Manchester, Eng., report of Sept. 14 refers to American inquiry for hoops and one or two small orders. American inquiry for wire rods continues and sales have been made at Manchester at about $45 f. o. b. Liverpool.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World*
705 PUBLICATION BUILDING, Sept. 27.

A convincing proof that the leading steel manufacturers have confidence in the maintenance of the present remarkable prices is found in the purchases of iron which have been made in the past fortnight. It requires the greatest confidence on the part of the manufacturer to pay $23.25, valley furnace, for Bessemer pig iron, deliveries only beginning next April, and extending over six months, yet this has been done in the case of large transactions. There can be scarcely any doubt that concerns which have bought pig iron have already sold their finished product at prices which would justify such purchases, and as all have a large pig iron production of their own, it seems clear that more finished product has been sold than could be produced with their own supplies of pig. It does not appear likely that there will be enough Bessemer pig iron to go around for the first half of next year, a condition produced partly by the fact that deliveries this year have had to hold over to next year, the actual pig iron which could be sold for the first half of next year amounting to not over three or four months' production.

There has been a decided change of sentiment among manufacturers in the recent past as to the influence which should be exerted on prices. Early in the present movement it was the almost universal desire to hold prices down, it being feared that the rise would not be of a healthy nature, and would only pave the way for disastrous decline. But prices have advanced despite all efforts to hold them down, manufacturers being taken up on offers which were intended to involve prohibitive quotations, so that almost against their will and certainly against any effort on their part, producers find themselves now pretty well filled with high priced orders. To permit any serious recession at this time would involve very disastrous results, and for this reason the strength of manufacturers will be exerted, should occasion arise, against any important decline. Since prices have reached their present level, being hindered rather than assisted by the efforts of producers, it would seem certain that they will remain about the present level when active assistance is rendered to maintain them. It should be remembered also in this connection that success in the way of maintaining a steady level is much easier with the present concentration of interests than it has ever been before. Foreign markets are ready to receive our products, in some cases at practically domestic prices, and in many cases at figures not much lower.

The general trend of prices in the past week has been upward. Bessemer and gray forge pig iron are higher, while steel is about the same. Plates and iron bars are higher, while sheets, both black and galvanized, are if anything

weaker. In scrap material the scarcity among dealers continues, although mills are not in general badly off for material, except in scattering cases. Premiums continue to be paid for prompt deliveries in a number of lines, notably bars, plates, and structural material.

PIG IRON.—There has been a continuation of the selling of Bessemer pig iron. Some of the earlier sales were made on the basis of $22.50, Valley, but the most recent sales have been at $23.25, Valley, and nothing better than this can now be done. There is practically no iron left for delivery during the first quarter of next year, while there is not a great deal remaining for the second quarter. Some sales at $23.25 have been made for delivery April to September, inclusive, and the market is very firm. A meeting of the Valley Furnacemen's Association was held in Cleveland last Saturday, at which nothing was done. It is very probable that the demands of steel mills for Bessemer iron cannot be filled. Several leading producers have pretty well covered for their requirements through the early part of the year, but there are others which have not yet bought and when they do come in they may find a worse state of affairs than they anticipate. Iron is being bought by districts which have not for many years past drawn on this region, because their local production is insufficient. In foundry iron the market is rather quiet. Sales have been made which pretty well take up furnace capacity for the first half of next year and so there is little iron to be had, while foundries seem to have covered for about all the iron they now see they will need. In gray forge there is close to a famine, and the greatest efforts are being made to secure the iron. Prices have advanced sharply and sales have been made at Pittsburg at from $21 to $21.50. In the valleys the situation is even worse, and there is scarcely any iron to be had there, with the result that prices are a shade above those at Pittsburg, while predictions are made in some quarters that Northern gray forge will actually be shipped to the valleys.

We quote the market as follows, it being understood that small lots of foundry iron are being sold for near-by delivery at very substantial premiums:

Bessemer, valley furnace	$23.25
Bessemer, Pittsburg	24.00
No. 1 Foundry	22.00 to 22.50
No. 2 Foundry	21.50 to 22.00
No. 3 Foundry	21.25 to 21.50
Gray Forge, valley furnace	21.25 to 21.50
Gray Forge, Pittsburg	21.00 to 21.50

STEEL.—Prices quoted in the Bessemer steel market for both billets and slabs are somewhat conflicting. Sales are noted for delivery this year at $39, maker's mill, while it is reported that in a number of cases prices substantially above $40 have been paid. There is very little being done, as steel is very scarce. There is some little enquiry for next year, and it is probable that some steel could be had for delivery during the first and second quarters at $38.50 to $39 for billets, while slabs are fully a dollar a ton higher than billets for either this year or next. In sheet bars there have been some sales at $38 and $39, while $40 has been quoted. The steel mills are as far as ever behind on deliveries. In open-hearth steel high prices are being paid. The demand has been quite large, but the open-hearth works have been in better shape to furnish material than the Bessemer works, notwithstanding which prices for open-hearth indicate a very wide spread. There are reports of sales at less than $50, but these cannot be confirmed, and it is represented that nothing below $50 to $51 can be done for the first half of next year, while for delivery within the next 60 days as high as $55 has been paid.

FERRO-MANGANESE.—This line is very scarce and little tonnage can be secured even at the scheduled price of $100 a ton for 80 per cent.

RAILS AND TRACK MATERIAL.—There is little doing in the rail market. The pool price of $33 to $35 is regarded as nominal. The mills being unable to fill present orders this year, will carry over a considerable tonnage, and considerable friction has resulted from efforts to place orders for even small lots. Light rails are very scarce and can only be had by paying very high premiums above the prices regularly quoted for standard sections. The demand for track material is very good, and both splice bars and links and pins are higher. There is an actual scarcity in splice bars, due to the fact that the rail mills, which usually supply the great bulk of the demand for splice bars, are entirely out of the market, and the demand has to be supplied from other mills. We quote the market for track material as follows: Spikes, 2.60c to 2.75c; track bolts, square heads, 3.10c; hexagon heads, 3.25c; splice bars, 2.60c to 2.60c; links and pins, 2.70c to 2.75c.

BARS.—Prices for iron bars have advanced sharply, and now if there is any difference between iron and steel bars the iron bars are the higher. In steel bars the minimum is 2.50c, while some makers are quoting as high as 2.60c for the first and second quarters of next year. For shipment within 60 days 2.75c has been freely paid. We quote iron bars, made from all muck stock, at a minimum of 2.50c, while 2.75c or even higher has been paid in cases of special deliveries.

STRUCTURAL MATERIAL.—The scarcity of prompt structural material continues, and the pool prices are largely disregarded. For shipment within the next month or two premiums of $5 a ton and over have been paid for small lots, while fitting shops are selling structural from stock at almost any price. We quote the fixed prices as follows: Beams and channels, 3 to 15 inches, 2.25c; 18 to 24 inches, 2.35c; tees, 2.30c; zees, 2.25c; angles, 2.25c. Universal mill plates are quoted at 2.75c to 2.90c.

PLATES.—Prices for plates are still higher and nothing can be done in tank plate below 2.85c, while 2.90c has been freely paid for rather late deliveries. For shipment within the next 60 days tank plate has brought from 3c to 3.10c, and other lines in proportion. We quote the market as follows for delivery December and later: Tank, 2.85c to 2.90c; shell, 3c to 3.10c; flange, 3.10c to 3.5c; fire box, 3½c to 4c.

PIPES AND TUBES.—The market continues very firm, with deliveries difficult to secure in less than two months' time. The mills are well filled with orders for several months. We quote the market as follows: Merchant pipe, 50 and 10 to 50 and 10 and 10, less than carloads being f. o. b. maker's mill; lap weld casing, 40 per cent off for screw and socket joint and 35 per cent off for inserted joint; boiler tubes, 1¼-inch to 1½-inch, 40 per cent off; 1¾-inch to 2-inch, 50 per cent off for iron, and 55 per cent off for steel; 2¼-inch to 6-inch, 55 per cent off for iron and 57 per cent off for steel.

SHEETS.—The sheet market is perhaps a trifle easier, caused, it is claimed, by the nervousness of some of the smaller producers, who have not been readily filled up in the face of a rather light demand. The leading mills continue to quote nothing less than 3.35c for No. 28 gauge, one pass through cold rolls, but from 3.20c to 3.25c has been done within the past week. The weakness in galvanized noted last week is even greater now, and 70 and 10 per cent off, with a 15 cent freight allowance, is the common quotation, while some two or three producers have sold within the past week at an additional 2½ per cent off in fair sized lots to jobbers. It is understood that the work of forming a consolidation of the sheet mills is going steadily forward, the principal work now under way being the arranging of the financial end of the deal. It is understood that the plans contemplate the raising of only a small amount of cash, which will all be used for working capital, so that there is likely to be no hitch in this direction, even in the present strained condition of the money market.

SPELTER.—The spelter market continues weak, and prime Western grades can be had at 5.50c, Pittsburg. It is predicted that spelter will soon again reach the 6-cent mark.

OLD MATERIAL.—Stocks in dealers' hands are very small, and prices in consequence are very irregular. It is understood that a number of leading mills are well provided with most lines required. New basic scrap has sold at $30 a ton during the week. It is learned that the rumor of a sale of old iron rails, involving considerable tonnage, mentioned last week, is correct. We quote the market as follows, Pittsburg, gross tons, except where otherwise specified: Steel rails, mixed lengths, $20 to $21; short lengths, $21 to $22; iron rails, $28 to $30; cast borings, $12, net tons; cast scrap, $18; No. 1 wrought scrap, $19 to $20, net tons; busheling scrap, $15 to $16, net tons.

COKE.—The scarcity of coke continues, owing largely to the short car supply. It is claimed that contracts running well into next year have been made for furnace coke at $2.75. We quote the market at $2.75 for standard Connellsville furnace coke and $2.75 to $3 for foundry coke.

CHICAGO,

Office of The Iron Trade Review and Industrial World.
1522 MONADNOCK BLOCK, Sept. 27.

General conditions have changed very little in the week. The demand for iron and steel is heavy, and large sales were made last week of several kinds of material. Mills are so fully sold up that there is very little business being done for delivery this year, and many of the mills are not making prices for next year's delivery except in the cases of railroads and implement manufacturers, both of whom must make their purchases this year for their needs during next year.

PIG IRON.—Sales were hardly as large as those of the week previous but aggregated a considerable tonnage, the majority of it divided between Southern iron and Lake Superior charcoal. For the latter the demand was heavy and sales exceeded those of the week previous. The prices on Southern irons have been advanced again and are now fully $1 higher than they were a week ago. Furnace agents seem to incline to the belief that further advances can be expected within a short time. The leading Southern producers are nearly sold up for the first six months of next year, and on some grades are entirely out of the market for that time. The demand is still large, and bids fair to continue so for some time. Many consumers complain because of their inability to get the iron they have bought, and in a good many cases foundries have had to make additional purchases wherever they could get the iron to cover a shortage caused by the furnaces' inability to ship iron as originally contracted for. The market has every symptom of strength and none of weakness. There is some talk that lower prices may come next year, but as so much of the producing capacity is sold for 1900 at the present high prices and it is easy to sell whatever the furnaces have to offer, bear arguments do not get much attention Quotations are revised as follows:

Lake Sup. Charcoal	$24 00@$26 00	Southern Coke No. 3	$22 15@$22 65
Local Coke Fdy. No. 1	23 00@24 00	Southern No. 1 Soft	24 15@24 65
Local Coke Fdy. No. 2	22 50@24 00	Southern No. 2 Soft	23 15@23 65
Local Coke Fdy. No. 3	22 50@23 00	Southern Silveries	26 50@27 00
Local Scotch Fdy. No. 1	23 00@24 00	Jackson Co. Silveries	24 00@25 00
Local Scotch Fdy. No. 2	22 50@24 00	Ohio Strong Softeners	23 00@24 00
Local Scotch Fdy. No. 3	22 00@23 00	Alabama Car Wheel	25 00@26 00
Southern Coke No. 1	24 15@24 65	Malleable Bessemer	23 50@25 00
Southern Coke No. 2	23 15@23 65	Coke Bessemer	24 00@25 00

BARS.—The demand is strong, and sales last week included several large contracts. The total tonnage placed was in excess of that of the week previous by considerable. Prices are unchanged and firm. Common iron is quoted at 2.30c to 2.40c, Chicago, and soft steel bars at 2.30c to 2.40c, half extras.

CAR MATERIAL.—A contract for 1,500 cars was placed last week in this district, as well as one or two of smaller size. The demand for car material just now is not large.

STRUCTURAL MATERIAL.—There is very little business doing, partly owing to the lateness of the season and partly because so many projects are held up because of the high prices of material. Local contractors are complaining because the mills delay shipment on nearly every contract. Prices are as follows: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches and over six inches, 2.50c; three inches to six inches, 2.40c; sheared plates, 3.15c to 3.25c; universal plates, 3.15c to 3.25c; tees, 2.45c; zees, 2.40c; small lots from store are quoted from ¼c to ½c higher.

PLATES.—There is no change in the situation. The mills are so well sold for this year that there is almost no business done for that delivery, and they are not making prices, as a rule, for next year's delivery. Prices are made as follows: Tank steel from store, 3.40c to 3.50c. Mill shipments, Chicago delivery: Tank steel, 3.25c; shell, 3.35c; flange, 3.40c; marine, 3.40c; fire box, 4c to 6c according to brand.

MERCHANT PIPE.—Business would be large if the mills were able to accept all the orders offered. As it is, it is limited in volume and only sales of small lots are made. Quotations are firm at 50 and 5 to 50 per cent off.

SHEETS.—The demand for black sheets is good, and several quite large sales were made last week. Black sheets are quoted at 3.35c to 3.45c, for mill shipment. Galvanized sheets are in lighter request and are quoted at 70 to 70 and 5 per cent off for mill shipment.

BILLETS AND RODS.—The local mills are not selling billets or rods as they have none for delivery this year, and have not made prices, so far, for next year's delivery. Mills farther east quote billets at $40 to $42, Chicago, for Bessemer, and rods are worth about $50, Chicago. Sales of sheet bars have been made on a basis of $36, Central Western mill, and $38 to $40, Chicago.

MERCHANT STEEL.—There has been quite a large business, with sales in excess of those of the week before. Several quite large orders are reported. Smooth finish tire steel is quoted 2.80c to 3c; smooth finish machinery steel, 2.95c to 3.05c; spring steel, 3.65c to 3.75c; tool steel, 7c to 7.50c; special, 13.50c and upwards

RAILS AND TRACK SUPPLIES.—While no further advances in the price of rails have been made as yet, it is expected that quotations will be at least $1 higher before the end of this week. Light sections have already been advanced $1 over last week's prices. The local mills have not made very large sales of standard sections as yet, their aggregate for the week being about 20,000 tons. Eastern mills have taken orders for something like 50 000 tons from roads in this territory in the week. There are a number of orders to be placed soon, and the tonnage it is thought will be fully as large as that of last year, notwithstanding the higher prices. Quotations are as follows: Rails, standard sections, $33 to $35; light sections, $34 to $40; splice bars, 2.50c to 2.70c; spikes, 2.65c to 2.75c; track bolts, 3.65c to 3.85c.

OLD MATERIAL.—There is still a decided shortage in several grades of scrap, and in no grade is there a surplus. The demand is large but dealers are unable to supply all the material wanted. Railroads let go of their old material very slowly and want the top of the market for all they sell. Selling prices are about as follows:

Old iron rails, gross	$27 00@$28 00	Axles, net	$23 00@$24 00
Old steel rails, long, gr.	18 00@18 50	Cast borings, net	9 00@10 00
Old steel rails, mixed	17 50@18 00	Wrought turnings, net	9 50@10 00
Old wheels, gross	19 00@21 00	Axle turnings, net	10 50@11 00
Railroad forge, net	18 00@19 00	Mixed steel, gross	12 00@13 00
Dealer's forge, net	14 00@15 00	Stove plates, net	9 00@10 00
No. 1 mill, net	12 50@13 00	Heavy melting steel, gr	16 00@17 00
Heavy cast, net	14 00@15 00	Old iron splice b., net	18 00@19 00
Malleable cast, net	12 00@13 00		

WIRE AND WIRE NAILS.—Business has been excellent. The demand is large and sales appear to be increasing every week. Quotations have not been changed. Makers quote single car loads of wire nails at $3.10 f. o. b. Chicago, and $3.20 less than car loads. On wire current quotations are as follows: Plain annealed wire, $2.95; painted barb wire, $3.55; galvanized barb wire, $3.70.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., Sept. 27.

There is an easing of the lake freight situation and it is more evident in the past week that no portion of the ore shortage will be due to lack of vessels to bring the ore down. Wheat taken at 4½c from Duluth yesterday means an ore rate of $1.67, but no ore charters are reported, though offers of tonnage at $1.85 were made on Monday. The ore is not to be had. Some little Marquette business has been placed at $1.55 and the Escanaba rate is $1.35, with a fair amount of chartering. Rough weather has held back vessels this week and there have been delays by shoal water at one or two lower lake ports. The receipts at certain Lake Erie docks indicate a falling off of at least 20 per cent in September from the record of August, and estimates point to a total movement somewhat under 13,000,000 tons to Oct. 1. Some ore has been going forward to Southern Ohio furnaces recently by all rail from the Menominee range, and arrangements have been made for all-winter shipments from two or three properties. The ore now going by rail is at a rate from mine to furnace less than the combined lake and rail rate under the high vessel freights of the past month, one road in particular making a low rate on ore to get a return load for gondola cars that have been busy hauling Hocking Valley coal into Northern Michigan. Unless it should expand greatly, however, this movement of all-rail ore to Central Western furnaces will not come to any considerable total. It requires about two weeks, shipments at the rate of a 20-car train a day, to equal one good cargo from a vessel of latest capacity.

PIG IRON.—Business with the foundries is quieter, in view of the large number of buyers who have contracted for six months of next year in the past 10 weeks. The list grows of furnaces that for the present are not selling, having nothing to offer for this year and very little for the first half of next year. There is some variation in quotations, but $22 at furnace on No. 2 is minimum and as high as $23 is asked, some furnaces quoting No. 1 and No. 2 on a par. The latest advance in Southern iron puts No. 2 close to $23 delivered in

Cleveland. Southern gray forge at $17 Birmingham is equivalent to $21.20 at valley mill, and the scarcity of Northern forge has put it on substantially the same basis, in some instances a trifle higher. Bessemer iron, limited as the supply is certain to be for the first half of next year, has advanced under recent sales to $23.25 in the valley for deliveries in the second quarter. We quote the Cleveland market as follows:

Bessemer	$24 00	Valley Scotch No. 1	$23 00@23 50
No. 1 Strong Foundry	23 00@23 50	Valley Scotch No. 2	22 25@22 75
No. 2 Strong Foundry	22 50@22 75	Gray Forge, valley	21 25@21 50
No. 3 Foundry	21 50@22 00	Lake Superior Charcoal	24 00@25 00

FINISHED MATERIAL.—Though by no means light, the demand upon local sellers has relaxed somewhat in the week, in the trade made up chiefly of moderate lots for early shipment. In the case of bars, purchases for 1900 have reached a large tonnage, however, distributed among railroad, agricultural, vehicle and other lines. There is more of a disposition on the part of implement manufacturers than was the case when prices were lower, to buy quite well up to their requirements for next season. Bar iron out of stock is now sold at 2.50c, Cleveland, and steel bars at 2.75c. Full extras are charged on purchases from stock. The new steel plant the Republic Iron & Steel Co. is erecting at Youngstown, using in part equipment from its Alexandria, Ind., plant, is expected to be ready in February or March, with a daily capacity of 800 tons. Structural demand has slackened, but bridge work continues active. We quote beams and channels at 2.25c, Pittsburg, but fitting shops with stocks get considerable advances on small sales, and angles command a premium. An inquiry for 2,000 tons of vessel plates has been out, but the business is not yet placed. On deliveries after Jan. 1 we quote 2.90c to 3c. Sheets continue relatively quieter. The roofing trade the past season has been affected by the high prices and there has been some diversion to other materials for roofing purposes. We quote No. 27 common black sheets at 3.30c, Cleveland, and gauges 14 to 21 at 3.10c. Wrought pipe are in demand for quick shipment beyond the ability of jobbers to supply material, mills being filled for three months. We quote 50 and 5 to 50 per cent off.

WIRE AND WIRE NAILS.—Demand keeps up well and is distributed through all lines. Barb wire shipments have been heavier than in any September for years. We continue quotations as follows, basis Pittsburg mill, carload lots to the jobbing trade, prices to retailers being $2 to $3 a ton higher: Wire nails, $2.80; smooth wire, $2.65; painted barb wire, $3.25; galvanized, $3 40.

OLD MATERIAL.—There is a good market for all offerings in mill, steel works and foundry scrap. Here and there transactions at high prices are reported, which seem to be beyond the general run. There is a good supply of material in some lines, owners of which are selling only as their price is secured, and some tendency to speculate. We quote old iron rails at $25 to $27, though a sale is reported as high as $29, valley; old steel rails, $20 to $22; No. 1 railroad wrought scrap, $20; old iron axles, $26 to $28; old car wheels, $19; machinery cast scrap, $16 to $16.50; wrought turnings, $12 to $12.50; cast borings, $11.

CINCINNATI

Sept. 26.

Rogers, Brown & Co. in their review of the course of the market last week say: "The event at the very close of the market Saturday, the 16th, was an advance of 50 cents per ton on all grades of Southern pig iron. The market opened on Monday very strong, and the advance of Saturday evening previous was not surprising to any one but by many was anticipated. The demand keeps up remarkably and sales for the week aggregate almost as large tonnage as marked the previous week. Prices have steadily risen. Some Eastern and Northern coke furnaces have sold No. 2 foundry at $23 at the furnace, and Southern iron has scored a clean dollar higher than on Monday last. The scarcity of foundry grades is very keenly felt, particularly by the smaller, though important foundries, whose habit is to buy for only one or two months ahead. The latest data as to stocks, Sept. 1, indicate that the furnace stocks combined fell to about 130,000 tons. Scarcity of cars in some iron and coke centers has occasioned a few furnaces to bank, which means not only curtailment of output but the weakening of the linings of their furnaces. The market is in the same excited condition as has characterized it for so many months. There is still an upward tendency as to prices on all qualities and grades of iron."

Matthew Addy & Co. comment on the situation as follows: "The annual car famine which the Southern furnaces always experience when cotton begins to move is very much in evidence just now. All of the Southern lines are more or less short. They have had difficulty in getting enough cars to move pig iron fast enough, and now that cotton, which pays better rates than pig iron and has to be moved promptly, has begun to be shipped, there is trouble. This trouble promises for the next six weeks to increase steadily, for it is not likely that the Southern roads can add materially to their rolling stock in that time. The pig iron market during the past week has been a shade quieter. This, however, is a relative statement, for compared with ordinary times the market was very brisk indeed. It was only quiet from the standpoint of the feverish activity in August. It was quiet particularly from the fact that a great many inquiries were turned down by sellers. They simply were not able to entertain them at all, not having the iron to supply. Matters seem to have reached such a pass now in regard to Southern iron that half of the inquiries that come up have to be turned aside simply because there is no way of making the shipments which are desired. Of course prices are a bit firmer than the Rock of Gibraltar. Anything that can be offered for prompt shipment these days is snapped up greedily."

We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $21.75 to $22.75; No. 2, foundry, $20.75 to $21.75; No. 3, foundry, $19.75 to $20.75; No. 4 and gray forge, $19.25 to $20.25; No. 1 soft, $21.75 to $22.75; No. 2 soft, $20.75 to $21.75; Lake Superior coke, No. 1, $24 to $24 50; No. 2, $23 to $23.50; Hanging Rock charcoal, No. 1, $24 to $25; Jackson Co. silvery, No. 1, $30 to $31; standard Georgia car wheel, $21.75 to $22.75; Lake Superior charcoal, $25 to $25.50.

PHILADELPHIA.

Sept. 26.

Makers of pig iron are still finding it necessary to decline to quote on considerable business offering, being unable to give the desired deliveries. Under this condition and with stocks practically wiped out there appears no foundation for the talk occasionally heard in this market, that would seek to discount values for 1900. The supply of iron is with difficulty made to go round but there is not so generally confidence as to the middle months of next year, Eastern furnaces being not so fully sold for next year as are those of the South and Central West. We quote No. 1X foundry iron at $23 to $23.50; No. 2X at $22.50 to $23; No. 2 plain at $21.50 to $22, and gray forge at $20.50 to $21.50. It is not believed that prices will change materially for some weeks, though there are those who look for a higher basis before Jan. 1. Prices are thought by many to be too high, but conditions govern, not opinions. There is a variation of $1 in some instances between quotations for next year. Several lots of foreign Bessemer iron have been negoitated for shipment to Pittsburg and other points. Basic iron has sold above $23, Bessemer at $25, and low phosphorus Bessemer at $28. The markets for muck bars and billets are firmer at $34 to $34.50 for the former, and $41 to $41.50 for October shipments of the latter, though for delivery in the first half of 1900 Bessemer billets are held at about $38.50. Prices in the past week have averaged still higher on finished material, and though some additions are made to producing capacity the complaints of buyers at non-delivery of material seem more frequent. Sheets have advanced $2 and structural material for anything like early delivery is from $2 to $3 a ton above the nominal basis of 2.43c for beams and channels. Mills report inquiries still coming in and there seems no end to the business, even though as seems certain, there is a constant postponing of a certain proportion of intended purchases by reason of high prices. Some rail business for next year is being booked by Eastern mills on a basis of $33 delivered in the Central West. A case is reported in which a steel mill is delivering $19 rails on an old contract, while the same road is delivering old rails to the same steel mill at $21. We quote best refined bar iron at 2.15c to 2.25c, at mill; tank plates, 3c; sheets No. 14 to No. 21, 3c to 3.20c; No. 27, 3.40c. Old material shows good demand with prices firm for everything. We quote as follows: Choice railroad scrap $21.50 to $22 50; No. 1 yard scrap, $16 to $17; No. 2 light scrap, $12 to $12.50; machinery cast $15 to $15.50; heavy steel scrap, $18 to $18 50; old iron rails, $23 to $23.50; old steel rails, $20 to $21; wrought turnings, $13 to $13.50; cast borings, $11.75 to $12; old car wheels, $20 to $21; iron axles, $26 to $28; steel axles, $18.50 to $19.

THE SELLING SIDE OF THE TRADE.

Representatives of Well Known Iron and Steel and Equipment Firms.

Since 1885 the Rand Drill Co. has been represented in the important fields for mining machinery reached from Chicago, by J. F. Lewis, who is one of the best known of the considerable number of men who have to do with the equipment of iron and precious metal mines. Mr. Lewis's first experience

J. F. LEWIS.

in the iron trade was in 1871 when he was engaged in Duchess County, New York, in mining iron ore for charcoal furnaces. Later he was engaged in Virginia as manager of blast furnaces, superintending also the mining of coal and ore and the making of coke. Developments in that state were then in their infancy and management was very much of a bricks-without-straw proposition. Taking up the work of the Rand Drill Co. in 1885, in the sale and installation of rock drills, compressors, and general mining machinery, Mr. Lewis has had much to do with engineering works, including the New York aqueduct, Chicago Drainage Canal, and the fitting up of mines with machinery through the South and other sections. He has been connected also with the building up of the Canadian Rand Drill Co. in Canada, being president of the company. Mr. Lewis is a member of the American Institute of Mining Engineers, American Society of Mechanical Engineers, associate member of the American Society of Civil Engineers, Western Society of Engineers, Iron and Steel Institute, Canadian Mining Institute. He has been vice-president of the American Institute of Mining Engineers for two terms and one of the managers for three terms.

Gas Engine Power for Malleable Works.

The Pennsylvania Malleable Co., Pittsburg, has let to the Pittsburg Bridge Co. the contract for the structural part of its main building, which will be 640 x 220 feet. There will be a number of other buildings for which contracts have not yet been let, including a brick building, 60 x 100 feet, for pattern shop and pattern storage, office building, etc. Contracts have been placed for six Otto gas engines, of 65 horse power each, with options on four more. This will be one of the first foundry establishments of such size in the world to use gas engine power exclusively. Electric transmission will be employed throughout the plant, the gas engines being all located in one power house. Contracts for the dynamos have been let. Contracts have been placed with the Sandy Ridge Fire Brick Co. for 500,000 fire brick, to be used in the annealing furnaces. There will be three air furnaces at the start and one cupola, and three more furnaces and two cupolas are to be added shortly. The cupolas will provide castings for the company's own use exclusively. Contracts for the blowers have been placed with the P. H. & F. M. Roots Co., Connersville, Ind. The structural work is to be completed by Dec. 15, and the plant is expected to be in operation between Jan. 1 and 15 next. The company is closely affiliated with the Pressed Steel Car Co., and the plant will be located adjoining the latter's new car plant at McKees Rocks, Pa. A considerable part of the output will go to this interest from the start. George S. White is president of the Pennsylvania Malleable Co. and David O. Holbrook secretary and treasurer. Dr R. G. G. Moldenke is superintendent.

Pittsburg Foundrymen's Association.

The Pittsburg Foundrymen's Association held its firstmeeting after the summer vacation Monday evening, Sept. 25, at the headquarters, Frohsinn Building, Pittsburg. The main feature of the evening, besides the nomination of officers, was the presentation of a series of stereopticon views of various departments of the famous Sulzer Bros. foundry at Winterthur, Switzerland. These views were kindly loaned for the purpose by Secretary John A. Penton, of the American Foundrymen's Association, who arranged for them with Mr. Sulzer when the latter was in this country some time ago. Dr. R. G. G Moldenke accompanied the views with a running description of the plant.

A committee was appointed to nominate officers for the election at the October meeting, and the committee reported as follows: President, Dr. R. G. G. Moldenke, of the Pennsylvania Malleable Co.; vice-president, Phillips Mathes, of the Brittan & Mathes Co.; secretary, F. H. Zimmers, of the Union Foundry & Machine Co.; executive committee, I. W. Frank, Wm. Yagle, Robert Taylor, B. D. Fuller, and E. A. Kebler. Mr. Zimmers is the present secretary. The president, secretary and treasurer are ex officio members of the executive committee. The members did not add any names to those placed in nomination by the committee.

Long Idle Foundries Wheeling Into Line.

One feature worth noticing is the number of abandoned or ill managed foundries, which succumbed to their own internal faults years ago, that are now being leased or purchased by more prosperous concerns, who find themselves either unable to increase the output of their own foundries or having no foundry of their own, desire to obtain their castings more promptly, if not at a less cost, than outside foundries are able to guarantee. The number of shops being thus resuscitated would make a long list.—[The Foundry.

A city contractor having occasion to use a good many castings for man-holes, catch-basins, etc., concluded to buy an old foundry and start it up to make his own castings The water power for driving the place was the lower one of a number on the same stream. A foundry foreman who knew all about the conditions, was questioned whether he would have power enough. "Oh, yes!" he said, he was sure he would, *as none of the people above him were using the power.* After getting started he was asked if he had power enough. "Oh, yes!" he said, "we have power enough, but there isn't enough water."—[American machinist.

Pig Iron Selling Record Broken.

The tonnage of sales of pig iron reported by Rogers, Brown & Co. for 1898, amounting to something over 1,000,000 tons, was considered the greatest amount sold in one year to actual consumers of foundry and forge iron by one firm. Rogers, Brown & Co. now state that during the first eight months of the present year their sales of pig iron have amounted to over 1,000,000 tons and during September are proceeding at about the same rate. They have ten houses located in the principal distributing centers of pig iron, the latest one established being at Birmingham, Ala. Notwithstanding the large contracts placed, the information received by Rogers, Brown & Co. from their various branches and salesmen shows that a large majority of consumers have not yet covered their pig iron requirements for the first half of 1900, and it seems apparent that demand will continue good for the remainder of this year.

THE National Tube Co. has declared the first quarterly dividend of 1¼ per cent on the preferred stock, payable Oct. 2.

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AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDR TRADES AND IRON AND STEEL MANUFACTURE.

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THE ANTI-CONSOLIDATION CAMPAIGN.

The indications are that the country has ahead of it a period of agitation and controversy over consolidations, that will be as productive of sophistry and sheer assertion, not to say bitterness and class malevolence, as was the 16 to 1 campaign of 1896. It matters not that there are no trusts in the United States; nor that all the corporations formed by the union of competing companies have been regularly chartered under State laws. There will be no discrimination between consolidations good and bad in the political discussions. Unless signs are misleading the party press and the general run of party orators will fall in line with popular clamor and condemn the consolidation as an evil that must be abated. Senator Foraker has had the courage to say some things that may well set the demagogic newspapers and orators to thinking. But that would be expecting too much. There must be another such accession of courage as led in 1896 to the squaring of the money plank of the victorious party with the truth about gold and silver, if we are to have next year any honest platform declarations about industrial consolidations. Just now partisan newspapers on both sides are vying in indiscriminate attacks and pandering to the unthinking instead of informing the people with discriminating criticism.

Senator Foraker is right in saying that consolidations are the fruit of competition. The evils of competition are very real forces that have been at work in the years since our industrial development passed the limit of internal requirements. Idleness for labor and loss for capital, in the alternation of famine and feast due to the dislocation of production and consumption, ought under wisely administered consolidation to give way to steadiness of employment at good wages, and the diversion into foreign channels of a surplus that under the old regime would have been a menace.

A specimen of the literature that inflames instead of honestly informing is found in an editorial recently appearing in a metropolitan journal counted a leader in the latter-day school of newspaper "enterprise." Without having any acquaintance with conditions, or, what is worse, deliberately withholding any truth it may have possessed, this paper undertakes to tell its readers of the cause of the temporary scarcity and consequent high prices of iron and steel. It explains that a Carnegie-Rockefeller-Frick combination is "in control of both ends of the iron trade"; that it has created a scarcity at the finished end by limiting the supply of Lake Superior ores. This combination, we are told, could easily build more mills, but it refuses to do so, that the people's needs may go unsupplied and prices be artificially sustained. The condition resulting is pointed to as one of the most vicious operations of the "trust" regime. Referring to the prospect that Lake Superior ore shipments will not equal the sales for this year, this stirrer up of antagonism to industrial corporations cries out, "Who made the shortage?" Who, indeed? By whose diabolical machinations was the supply of work in the iron and steel industries made so great that there is a shortage of the labor necessary to get down the ore? Who has "cornered" the labor of the country, not only "at both ends" of the iron industry, but at every one of its intermediate sections? And who is this that could speak mills into existence to-morrow, to relieve the famine-stricken market and yet withholds the saving word?

But there is no monopoly in either political party of this facility in fabricating "facts" as a basis for sweeping denunciation. Senator Washburne, of Minnesota, who ought to know better, said in an interview the other day that "as a result of trust manipulation, steel rails now sell at $30 a ton or thereabouts,' and after assuring us that "of course the profit is exorbitant" and "the present price is outrageous," calls on his party to repeal the duty on steel rails. He intimates that rails were sold before the advance at $17 a ton, "at a profit of perhaps $1.50 a ton," and that there must be a return to this basis if we are to keep up our record for exports. Of course the fact that steel billets, on which there is no concert of action by manufacturers, have sold recently at $38 to $40, and have been for months above the price of steel rails, which are more expensive to roll and are subject to rigid inspections and consequent rejections, does not find place in the Senator's denunciations. Nor does the fact that at the time he made this utterance concerning the imperative duty of sweeping away a tariff that upholds such outrageous prices, English rails, which a year ago brought £4 12s. 6d., were selling at £6 15s. or $32.75 at Middlesbrough, Eng., $2.75 above the price that has aroused the Minnesota Senator to such a pitch of indignation against the steel manufacturers of his own country. After our rail manufacturers have presented the railroads with a year's supply of rails at substantially the cost price, are they to be judged guilty of a high crime in coming at length to a par with English rails and within reasonable reach of Bessemer steel billets?

What is wanted is courage and truthfulness in discussing the consolidations. If they have thrown

some men out of employment by new selling methods, as new devices in the shop have done time and again, say so. If they have made steady employment at good wages surer to their army of workmen, let that be said. If a temporary pressure of demand beyond the ability of the producing outfit to supply has forced prices up to an unusual and unnatural level, tell the truth about it, and wait until the consolidations have made advances by reason of monopoly control of supplies, before laying that charge at their door.

If consolidations, as time goes on, bind burdens upon the people and do not fulfill their promise of benefits to their stockholders, their employes and the public, then judgment against them may justly be made up, on the facts as they exist. But headlong condemnation, based on a preconceived theory of their operation, is devoid of all fairness. Just now, men who discriminate, who think for themselves instead of taking their opinions ready-made from the uninformed, the prejudiced and the truckling, can do inestimable good by speaking out. The industrial consolidations, such of them as are good, are here to stay. They must be studied, regulated and improved, just as any new machine must be perfected in the using. It is not necessary to burn down the house to get rid of the rats. Sensible men will see that the old days in business have gone and with them the old ways. Blind, indiscriminate dennuciation will not help the people; and the cry for the wiping out of large corporations will prove as unavailing as were the attempts of farm hands to smash the modern harvester.

THAT the number of active blast furnaces may increase materially without anything like a corresponding increase in output is apparent from the statistics of pig iron production on Sept. 1, as compared with those of Jan. 1:

	Jan. 1, 1899.	Sept. 1, 1899.	Increase.	Per cent increase.
No. Furnaces in blast	200	257	57	28.5
Average weekly capacity, gr. tons	243.516	267.335	23,819	10—

While the 200 furnaces in blast on Jan. 1 had an average weekly output of 1,200 tons, the 57 added furnaces of Sept. 1 only gave 23,819 tons a week, or an average of about 400 tons. The figures are a suggestive commentary on the character of most of the stacks that are going in under the attraction of high prices.

THE lot of buyers of iron and steel at this juncture is not a happy one. Harrassed for several months by inability to get material just as it was wanted, they are now wrestling with the problem of supplies for next year. The experiences of the recent past they do not want to duplicate, and yet many hesitate to pay the prices that are asked for next year. Fear of failure to get iron or steel when needed appears to turn the scale, and thus not a few buyers, particularly in the finished lines, are contracting, often against their judgment, paying prices which they believe are close to the top of the present movement, if not at the top.

ROGERS, BROWN & CO., pig iron selling agents, have opened a branch house in Birmingham, Ala., with W. L. Sims & Co. as representatives there. Their offices are in the Steiner Bank Bldg.

PERSONAL.

Charles H. Blomstrom, who for some time past has been chief draftsman at the Lake Shore Iron Works, Marquette, Mich., has been appointed to the position of manager, succeeding the late S. H. Holley. Mr. Blomstrom has patents on the Superior gas engine which is built by the Lake Shore Iron Works.

William Jordan, for the past three years superintendent of the Cumberland tin plate plant at Cumberland, Md., has resigned his position in order to take charge of a tin plate plant building at Washington, Pa. Mr. Jordan was given a gold watch by the workmen at the Cumberland mills.

P. L. Kimberly, of Sharon, Pa., has been looking over Utah mining properties.

C. W. Harrison is to act as export sales manager for the United States Cast Iron Pipe & Foundry Co.

C. Erbsloh, a representative of the Krupp works, Essen, Germany, will spend two weeks visiting the mills of Pittsburg, and will then go to manufacturing centers of the West and South. He is quoted as saying: "Any country in Europe could stand the establishment of several car and locomotive works without overdoing the business. There is a growing shortage of railroad equipment, and the fact that the United States is unable to supply the demand makes it imperative that new works be established in Europe."

President A. J. Moxham, of the Lorain Steel Co., has returned to his home at Lorain after some months in Europe. With his family he will leave shortly for New York and after the international yacht race will go on a cruise in Cuban, Porto Rican and South American waters for the winter.

A SPRINGFIELD, O., dispatch says of the local foundry situation: "The Springfield Malleable Iron Co., is having all it can do. It is employing 400 men, and will put on more soon. On Friday 70 tons of iron were melted, the largest in the history of the plant. This will be increased if possible. Owing to the scarcity of iron the Warder, Bushnell & Glessner Co. had to purchase and equip the old Whitely malleable iron shops, which began operations to-day with 100 men. More will be put on. P. P. Mast & Co. had to close several days last week on account of a lack of iron."

A PHILADELPHIA dispatch says that an extra dividend on Cambria Steel is expected about Oct. 1. "The amount, it is said, will be 75 cents, which rate is to be continued for the last quarter of the year, making $2.50 for the entire year, or 5 per cent on the par value of $16,000,000. Earnings for the year are estimated at $2,000,000 after all fixed charges are paid. This would leave an amount in the treasury equal to $4 a share after the $2.50 has been paid."

Contracts have been taken by the Wm. B. Pollock Co. and the Enterprise Boiler Co., of Youngstown, for the construction of the shells for the four new furnaces the National Steel Co. is to build—two at Mingo Junction, one at New Castle, Pa., and one at Youngstown, O.

EDWARD BALTZLEY, of Washington, D. C., has purchased the Kellogg Seamless Tube plant, and the court has confirmed the sale. The price paid was $43,000. Wm. Heckert, patentee of tube rolling devices, is said to be connected with the new owners.

APPLICATION will be made Oct. 18 by Clare G. Tucker, Chauncey Lobinger, R. D. Elwood, Jr., N. L. Holmes, and R. L. James for the incorporation of the Bakers' Machinery Co. The plant is to be located near Pittsburg.

THE Indiana Bridge Co., Muncie, Ind., will not enter the proposed consolidation of bridge companies. The King Bridge Co., Cleveland, and the Massillon Bridge Co., Massillon, O., are also outside the movement.

FURNACE G at Braddock of the Carnegie Steel Co., Ltd., has been relined and is to be blown in this week.

THE George B. Sennett Co. has just completed the shipment of equipment for a Heyl & Patterson pig iron casting machine to a Russian firm.

IRON AND STEEL STOCKS IN THE WEEK.

Denison, Prior & Co., of Cleveland, say in their weekly iron and steel letter: "Forced liquidation has had its effect on the market. The rule that dear money means cheap stocks has again had an illustration. The steel stocks, however, made many friends during the decline. Their action was far better than had been anticipated, and with the exception of Republic Steel preferred, which sold at 70½ on Sept. 20 no new low records were made.

"The American Hoop issues have been the strong feature of the week, the common stock having made a new high record of 45½ on Sept. 25. Many reasons are advanced for the strength of the Hoop stocks. It is said on excellent authority that the present earnings of the company are far exceeding the most sanguine expectations of the promoters of the deal and that there are prospects of surpassing even the present excellent record.

"The issues of the Federal Steel Co. have suffered to a greater or less extent from the general pressure which has been brought to bear upon the Flower specialties. The settlement of the litigation regarding the payment of dividends on the preferred issue of the Federal company in a measure tended to offset the effect of the general depression, although some disappointment was expressed at the manner in which the directors of the company made the dividend declaration. Tennessee Coal & Iron, occupying the false position that it does, in a market way, is a real menace to the other iron and steel issues. There is absolutely no excuse, from the standpoint of legitimate industrial conditions, for the exceedingly high quotations which are daily made for this stock. There has not been sufficient improvement in the business of the company to warrant the difference in the price of the stocks. The company does not occupy an exceptional strategic position in the iron trade, yet its stock sells many points higher than that of any other iron or steel company in the market. The time will come when the manipulation of this pool will have cleaned up all the profits they desire from the unfortunates who are short of this stock, and then the fall will follow. When it comes other and more legitimate stocks may suffer. Tennessee Coal & Iron should be let alone; none but an insider should trade in it. It is extremely high in price but it is not safe to sell it short. The stock is cornered and corners in a speculative market should be avoided."

Fluctuations of the Week and the Year.

The following table shows the fluctuations in iron and steel stocks in the week ending with Monday, Sept. 25, and in the present year:

Name.	WEEK.				YEAR.			
	Open	High	Low	Close	High.		Low.	
Am. Car & Fdy	17¾	17¾	17	17	21⅜	May 25	15	June 15
Am. Car & Fdy pr	64¾	65⅛	62½	62½	68⅜	Sept. 7	56⅜	June 16
Am. Steel & Wire,.	50	52½	46	50⅜	72	May 4	45	Feb. 8
AmSteel & Wire pr	97	97½	95½	96½	106¾	Mar. 13	92½	Feb. 8
Am. Steel Hoop.....	38⅛	45¼	38⅛	44¼	45½	Sept. 25	24	May 24
Am. Steel Hoop pr	84	86	83	85½	86½	Sept. 14	70	May 13
Am. Tin Plate,.....	39	40	37⅛	38	52¾	April 4	33	May 24
Am. Tin Plate pr..	86¾	87¾	85¾	87	99½	Feb. 8	81	June 1
Col. Fuel & Iron,..	55½	60¾	54⅞	57⅝	64	Sept 11	30½	Feb. 8
Federal Steel.....	53⅛	55¾	51	53⅛	75	Apr. 3	46⅜	Feb. 8
Federal Steel pr....	78	79⅞	75⅛	78	93¾	April 3	72½	May 13
National Steel.....	51	53	49¾	51⅛	63	April 24	43¾	June 2
National Steel pr..	96	98	95	96	99¾	Aug. 11	85	May 15
Pressed Steel Car..	57⅛	57⅛	54	56½	61	Aug. 14	44¾	June 1
PressedSteelCar pr	89	90⅝	89	90	91	Sept. 7	78	May 25
Republic Steel	29¾	2	26¾	28	33⅜	Sept. 6	22¼	Aug. 26
Republic Steel pr..	72	74¼	70½	74	79	Aug. 29	70½	Sept 20
Tenn. Coal & Iron	116½	122½	113¾	116¼	126	Sept 11	36	June 14

STATE Geologist Blatchley, of Indiana, in his annual report says of the natural gas supply: "During the last five years all pipe lines have been extending toward the center or heart of the field, until now the center is reduced to less than 150 square miles. All the porous Trenton or gas-producing rock in the Indiana field is more or less intimately connected, and whatever tends to reduce the supply in one part of the field has the same effect on all parts. This is shown by reduction of pressure in the practically undeveloped center. Wells therein drilled for local use showed in November, 1898, a pressure of only 181 pounds, as against 264 pounds in 1895. The average rock pressure of the entire field in November, 1897, was 19 pounds; in November, 1898, 173 pounds."

EUROPEAN IRON MARKETS ADVANCING.

BERLIN, Sept. 11.—Very little that is new can be reported of the Upper Silesian iron market this week, prices being firmly maintained and the works continuing well supplied with orders. The output of pig iron, having regard to the supply of coke, is maintained at a maximum, the whole of the large production going into immediate consumption. Partly manufactured materials, such as blooms and billets, is in short supply, this causing much inconvenience to the finished iron and steel works, which are pressed with orders. A large business is being done in plates and sheets, as also in joists and other constructional iron work. A large output of railway material is being recorded mainly for the State railways. The great extension of local railways and electric tramways is, however, also providing a large amount of work to this branch. Every department of the Rhenish-Westphalian iron market continues in an active condition, and the output would be increased were it possible to obtain larger supplies of raw material. The scarcity of coke is seriously interfering with the production of pig iron, one blast furnace in the Siegen district having already had to be blown out from this cause, while several others are in light blast. At a meeting of the trade at Dusseldorf last week, English foundry pig No. 3 was advanced to 88s. per ton, as against 86s. per ton a week or so ago; Siegen forge pig is quoted at 76s. to 78s.; steel pig, 78s. to 80s.; German Bessemer pig, 88s.; German foundry pig, No. 1, 88s., and No. 3, 84s. The finished iron and steel departments are all working at full pressure. In rolled tubes quite a large business is just now being done, while for sheets there is great pressure of demand with a corresponding strong tone in prices, the current base quotation being about 200s. per ton. A further advance of 10s. in the prices of bar iron has just been made, bringing the quotation up to 200s. to 210s. per ton.

VIENNA, Sept. 11.—An active tone is prevailing in the iron market here. The demand for all qualities of material is greater than can be met, and although prices have not been further advanced, this is due to the fact that this year's output has all been disposed of, and that makers are not yet open to negotiate for supplies over next year. The reason for the latter step is that Austrian producers are awaiting the result of the negotiations with makers in Hungary with regard to prices.

PARIS, Sept. 12.—The iron market in this city has shown a strong tone during the past week. Merchants experienced no difficulty in maintaining their quotations of 250fr. per ton for merchant iron and 260fr. for joists. Indeed, to ensure prompt delivery even higher prices than these have been paid in a few cases. A number of the various syndicates have held meetings during the past week, and at most of them the opinion prevailed that prices have not yet touched the highest point. In the Haute Marne makers continue to quote 250fr. for bar iron, but an early advance is not improbable. A large amount of work is in hand at both the rolling mills and the foundries, and in view of the high cost of raw material there is no immediate prospect of easier prices ruling.

BRUSSELS, Sept. 12.—The position of the iron market here is one of increasing strength. It is necessary to go back fully 27 years to encounter a period of prosperity comparable to that now prevailing in the Belgian iron industry. Of course during the interval there have been good times, but they have never lasted so long, and have never been so brilliant nor so general. They were partly due to speculation. The present boom, on the contrary, is simply natural. The rise is due, on the one part, to the great demand, and on the other part to the limitation of production, which in turn is due to the scarcity of raw materials, particularly coke, and therefore also pig iron. The imports of British pig iron into Belgium during last month reached a total of no less than 12,495 tons, as against only 6,849 tons in August last year. All the rolling mills continue busily engaged and have good future prospects, as several contracts for supplies over the first quarter of next year have just been placed. Bar iron is quoted at 185fr. per ton for No. 2, and 190fr. for No. 3; joists, 182½fr.; sheets, No. 2, 215fr. (an increase of 15fr. on the month); steel plates, 230fr., and steel rails, 160fr., all f. o. b. Antwerp. A year ago steel rails were selling at 105fr.

MALLEABLE FURNACE PRACTICE AND ANNEALING.

BY "FURNACEMAN."

Never has any metal known to the iron casting industry attained the position now occupied in the commercial world by the malleable casting. Perhaps the most gratifying feature connected with its manufacture arises from the fact that wherever it has been introduced it has always developed, to the exclusion of other metals. There was no decline in its quality which otherwise might have prejudiced the oft-time doubtful purchaser; and this excellence of product is due entirely to the most careful observance of metallurgical operation by those most interested. It is always gaining ground, and when used in castings upon which the service strains are frequent and of varying stress, it has yet to demonstrate a failure. This is best illustrated in the instance of car-building, where the displacement of gray iron has been complete. To-day it is entering slowly and gradually (as it always does) upon a new and very extensive field, namely, stove-building. There will be numbers of reasons advanced against its fitness for this class of work but these objections will be overcome when the application begins in real earnest. We now have malleable "feet," and other parts will soon follow.

As the production of malleable is so at variance with that of gray iron and there are many misapprehensions, often grave enough to retard possible purchasers from specifying it, perhaps the following brief notes on actual practice may serve to remove some of the doubts upon the subject.

Cardinal Points About Malleable.

Malleable cast iron is a metal from which, during the process of production, certain quantites of carbon have been removed, thus following a metallurgical law, that the lower the percentage of carbon the softer and more ductile will be the metal. Carbon is present in two conditions in pig iron: graphitic and combined. As graphitic carbon it is supposed to separate on solidification after a fusion; and as combined it produces a white fracture in metal more or less granular. The former will be the soft irons or "grays," and the latter the hard irons or "whites." When a heat is charged into an air furnace the carbon is (generally speaking) in the graphitic condition, and by the oxidizing flame there encountered passes by almost imperceptible gradations into the white or combined condition. There is an intermediate state when the metal is mottled, or having the carbon about half and half, and this is the mottled iron of commerce. There may be combined carbon in gray iron, and conversely white iron may contain appreciable quantities of gray or graphitic carbon. The mode of existence of carbon in iron is determined to a great degree by the conditions of solidification after original casting, and the amount of heat to which it has been subjected. Rapid cooling favors the retention of carbon in the combined state, and by this means it is possible to change gray iron into white. The amount of total carbon in pig iron, whether it be gray or white, is generally about the same, and its form in one and the other is due directly to a heat condition at the blast furnace. If the iron is very hot, and the percentage of silicon high, the metal will be slow in cooling, and graphitic carbon will be disseminated throughout the mass, giving it the characteristic fractures of a No. 1 and No. 2. If the iron be cold, and the percentage of silicon is low, the carbon by reason of rapid cooling will enter into combination with the iron, and white iron will be the result.

For many years charcoal iron was preferable in malleable casting, as the ores were reduced by charcoal and cold-blast, and really did chill more deeply than other irons; but with the latter-day demand for tonnage coke iron has been introduced, and in many quarters has entirely superseded charcoal. The form of carbon in pig iron is, therefore, only an accidental mechanical admixture while in the malleable casting it is a definite chemical combination with the iron. The theory of malleable cast iron is to produce a material differing from gray iron in that its carbon has been lowered materially, thus allowing it to withstand blows, etc., without breaking. Malleable cast iron is therefore the result of a process of decarbonization by means of a sesqui-oxide. The latter by imparting some of its oxygen to the carbon in the castings, at a red heat, forms CO, and thus extracts the carbon. The theory is that any substance having an affinity for carbon, will extract carbon under a heat condition. This feature is now accomplished by packing the castings in rolling mill scale treated with a mixture of sal-ammoniac, and under the excessive heat temperatures the CO is formed and given off. Castings are sometimes packed in hematite ore, and this rich ore is used to decarbonize the castings. From its use arises the term "hematite malleable iron."

The Cupola for Malleable Work.

There are three forms of furnaces used in the production of malleable—the cupola, the reverberatory or air furnace, and the open hearth furnace. Each has separate points of excellence not found in the others, and all are producing satisfactory metal for specified purposes. The cupola is not used very extensively in malleable excepting for the manufacture of specialties, owing to the one great difficulty experienced in combining carbon sufficiently to insure the possibility of pouring large castings; also from the fact that there is no method of puddling or mixing metal except in the tapping ladle. If it were always practicable the cupola would be an ideal method for melting, as the economy in fuel consumption is no mean consideration. At present the cupola is used for the pouring of light shapes almost entirely and in some works the tonnage is very high. One great drawback has been the proclivity of cupola metal to absorb impurities from the fuel, principally sulphur, which metalloid is considered by many authoritative minds to be highly deleterious, although at the present moment there seems a slight weakening in this respect. Sulphur in steel makes that metal "short," ductility being an impossibility when sulphur is present, and in quantity. In malleable metal a condition often arises in which the metal after annealing will have a crystalline grained fracture, sometimes mistaken for under-annealing. There can be no question that a combination of reactions in which sulphur had played a part, caused this molecular peculiarity, as it is not a natural sequence of the annealing of metal in which the carbon has been, or should have been, in combination at the moment of casting. It might appear from the information available that sulphur in excess has no bad effect upon the casting, but at the same time divergence in practice must be made to comply with prejudices. If consumers would accept metal with a grained fracture the founders would be enabled to make many departures in melting. The cupola practically makes no change in the chemical or molecular aspect of the metal; it merely melts. Whatever may be the physical characteristics of the pig iron charged these will be reproduced in the metal caught at the spout. The molecular change in this metal comes almost entirely with the chilling of metal in the molds at the moment of casting. If the pattern is of sufficient diameter the metal will remain hot for a short moment, and the dampness of the mold being quickly overcome, the result will be that the casting will be gray, and cannot be annealed to advantage. It has always been counted a fact that cupola metal is hotter than air furnace metal, on account of the method of melting; and it is also generally conceded that the cupola metal being higher or richer in graphitic carbon and silicon is hotter by virtue of these contained metalloids, while air furnace metal is hot only because of the induced heat of the furnace. This fact of cupola metal being always gray when poured into large castings, precludes the possibility of success in this particular. In only one instance has this class of work been poured successfully and that is in the instance of so-called semi-steels, when the combination of carbon has been effected through the liberal use of sulphide of iron. With this latter mixture the cupola performs its work as satisfactorily as the air furnace, and metal is first-class for purposes intended. Using the best grades of charcoal and coke irons together with liberal percentages of sprues or gates, there is no great difficulty in producing small castings, and the range of cupola work is covered by the word "small." Carriage and harness trimmings, pipe fittings, etc., are the main tonnage at present.

The Reverberatory Furnace.

The reverberatory air furnace is the generally accepted type for malleable purposes. There are more of this style in operation than any other, and yet there are some classes of work which can be better produced in another furnace described later. There is nothing in its appearance suggesting complex construction. It is a very simple affair, and yet when its

lines have been changed even slightly, the foundryman is thrown out of reckoning at once. The air furnace was the original casting hearth, and has certainly withstood all suggestions of improvements. The reason is that nothing simpler could be designed. For many years the mixture has been made up from the fracture of pig, together with the grading and calculation of silicon by allegation. There was no attention given the other metalloids. The advance of chemistry brought wonderful hopes for dependence upon the worth and reliability of other impurities, but outside of the heat conditions of the first casting at the blast furnace (which are contained in the metalloid silicon) the others have failed to come up to expectations. A heat condition must be realized and recognized before a mixture can be calculated successfully. In the old days when a heat was selected, there was always a large proportion of No. 1 or rich iron chosen. A heat condition was in vogue, though possibly not then recognized as such. In modern practice the effects of all the metalloids are understood, but are not given ranking with silicon. Carbon as ever is all-important but without the presence of silicon its action is void, indeed. No better illustration of the dependence placed upon silicon may be had than if, in making up a heat for air furnace, a No. 5 iron should be substituted for No. 1. The metal when tapped could only be poured into large castings, as its carrying powers would be at once curtailed.

The theory of flame-influence upon metal in bath is the same in reverberatory furnaces as in all melting hearths, namely, a reducing and oxidizing force. In earlier days when the charge was so rich in soft irons, together with small quantities of sprues, there was no possibility of reducing the silicon and effecting the combination of carbon except under continued periods of forcing. The sprues which to-day are accounted the best factor in the mixture were allowed to accumulate, and were eventually sold for scrap. The idea of adjusting the heat through the manipulation of contained metalloids in pig was not in any degree attractive. It was all made upon grade and fracture, consequently when charged it could not be hurried along, but rather was allowed its own time to develop. The same feature is present to-day, of rushing a heat in which the percentages are not thoroughly calculated, and the combination of carbon is effected by means of forced heat. When the castings are forced the carbon, on account of this hasty and imperfect treatment, will revert again to the graphitic state, thus rendering the castings worthless. A heat of malleable cannot be forced successfully beyond the capabilities of its chemical constitution, which affects these combinations; but heats may be made up, from exactly the same irons and sprues, and some will be ready to tap in four hours while others will require six and seven hours.

It is this knowledge of metallurgy, chemistry, and manipulation that marks the best melters to-day. The advance in melting has been coincident with the demands of tonnage, which makes it necessary to melt three heats in the time formerly required for one, and using the same grades of iron as before. It is the constant application of the knowledge of effects produced by the various ingredients that has advanced the melting ratio so greatly. In this respect the air furnace easily proves its worth over the cupola. Heats are charged and the burden of responsibility for their development rests with the silicon content. Carbon is no longer given precedence in calculating, as we are recognizing a heat condition accompanying carbon, and the certain percentages of silicon, contained in the pig work out the physical problems of melting. For light castings the silicon runs from .90 to 1.25 and is the metalloid which promotes the carrying ability of the metal, as it is the natural element of contained heat.

That carbon is not, and cannot be the controlling influence for fluidity is no better proved than when contrast is made between heats for light and heavy work. The carbon content in both varies but slightly, the silicon radically and the fluidity or staying qualities of the heats bear no comparison whatever. In air furnace practice for light castings of small diameters and varied shapes, where it is a question of pouring iron sufficiently hot to run patterns, the combination of carbon is effected to a great extent by rapid cooling in contact with damp sand. In respect to heavy castings of deep diameters the carbon must be combined in furnace before tapping, and this is brought about with the smaller amounts of silicon, thus reducing the initial heat of metal. This allows the metal in large castings to "set" quickly. Were there a high percentage of silicon present in heavy work mixtures, the castings would retain fluidity long enough to allow graphitic carbon to precipitate, and be disseminated throughout the castings, which therefore would be gray and worthless.

Heat Management.

The time of heat in the reverberatory furnace depends upon how refractory the charge may be. If the iron charged is rich, the heat will come up much more quickly, and the iron be hotter than if the charge were "lean" or high iron; for after the latter is melted it must be heated still further by the artificial means at hand, as it contains no latent heat energy in itself. The quality of coal used and the pressure of blast have a very important bearing in this style of furnace. A soft blast is much to be preferred, depending in a measure upon the quality of coal used. With high blast pressure there is always a tendency toward dirty metal, and the chance for occluded gases causing blow holes below surfaces greater. Again, should the blast be too strong there will be a large loss in oixidization, for after the metal is skimmed the flame will have every chance for play. The loss in furnace by oxidization is sometimes as high as 12½ per cent of the total charge. The overhead blast, or air introduced over the fire bridge wall, has had a great influence on this latter loss in furnace.

The size of air furnace is growing larger every year. Some of the later ones melt as high as 16 and 18 tons—this, of course on heavy work, when the metal is carried away in large ladles. The melting ratio has been very general, and it takes from 40 to 50 per cent coal to melt one ton of iron charged.

The Open-Hearth Furnace for Malleables.

The Siemens-Martin acid open-hearth furnaces have been the latest style adopted into the malleable casting industry. Its sphere has been heavy work casting entirely, and we have yet to hear of its continued success on light work. These furnaces melt through the influence of a hydro-oxygen flame. The hydrogen is from the carburetted hydrogen of coal gas, and the oxygen from the atmospheric air. These gases before they are combined are heated by the exhaust heat of the furnace, which in ordinary constructions passes directly to the stack, but in this style furnace is utilized to heat a chamber composed of brick checker work. The atmospheric air is introduced by means of a valve into the chambers and enters the furnaces very hot. One feature of these furnaces is economy in fuel; another the possibility of melting iron away from the contaminating impurities contained in coal and coke. This furnace is much hotter than air furnaces and better brick are required in construction. The temperature of the bath rises after the melting point to 3,500° and 4,000° Fahr. The make-up of a heat does not vary greatly from other practice, excepting that it will carry higher percentages of wrought scrap. This latter on account of its low carbon, forms an attractive feature in the mixture. The flame being very intense oxidizes the metal rapidly, and the combination of carbon is effected, beyond doubt, long before the metal is hot enough to flow. For the manufacture of railway couplers, draft-rigging and all car-body work, this furnace produces a metal which for uniformity stands alone. The metal after annealing is softer and tougher on account of the low carbon content.

This furnace is always under perfect control, as not only may the supply of gas and air be governed in the valve passages, but also, if necessary, the production of gas may be shut off at a moment's notice and re-started in the same. It will thus be seen how substantially this furnace competes with air, or other reverberatory hearths for all the purposes required. The economy in fuel is estimated at fractionally one-half (when making comparisons), even when the same grade of coal is being considered, and the possibility of using the poorer grades, such as "slack," which may be converted into perfectly clean gas, away from the furnace, an advantageous arrangement indeed.

During the progress of a heat in the open-hearth furnace several phenomena are observed which do not occur in air furnaces. One is the visible fermentation taking place in the bath. This latter is especially distinguishable in heats where

the charge is rich in graphitic carbon. White iron does not act in this manner. The cause for this phenomenon may be explained by the fact that with the evolution of gas generated by the combination of oxygen and carbon, small particles of iron are drawn to the surface, and burning there for a moment with bright scintillation disappear as the gas has spent its energy, and there being nothing left of these particles of iron to attract gravity. This latter feature is of course one of the principal reasons for furnace lossses in melting. As this action increases the iron in bath coagulates or becomes granular. This feature will also appear on the top of ladles, when iron has been superheated. This furnace, as before stated, is most suited to the casting of heavy work, and often during the progress of heats a small quantity of ore has been introduced as an advantage in reducing carbon, etc. This should be used, however, with great caution, as the reaction being very positive, if used too strongly, will produce dull metal, as the latter has already lost considerable of its carbon and silicon.

The road to a direct metal in malleable (thus avoiding the long annealing process) lies in this direction. This metal must be low in carbon, etc., and still have fluidity to run in green sand molds. This has been the stumbling block in every experiment tried in this connection. There has been no difficulty in producing a low metal, but it was always a "mongrel" steel, requiring a hard mold, and of course it is easier to anneal castings than to dry molds. Therefore the field is still open. The open-hearth furnace is not restricted to the use of producer gas, but natural gas and fuel oil may be used, there being very slight mechanical changes necessary for their adoption.

The Process of Annealing.

The annealing of malleable cast iron is a very lengthy operation, and many unsuccessful attempts have been made to shorten it. Its duration may be said to vary with localities and mixtures, for we hear of firms whose practice is a four-day anneal, while others require ten, and claims made that patterns are similar. The annealing oven is of very simple construction, there being nothing in its operation which requires high operative ability. Its only chance for success depends wholly upon the condition of the metal in castings, as they come from the melting furnaces. It possesses no power whatever to change the chemical and physical complexion of metal, beyond the elimination of certain percentages of carbon and silicon. We often hear of metal being "burnt" in the anneal. No metal can be burnt unless it is brought in direct association with a reducing flame, and should the metal have the appearance of burnt iron, it may be depended upon such was the condition of the metal when tapped at the melting furnace. The annealing oven cannot overcome any defect arising at casting. There is nothing but heat in the ovens and nothing but heat will affect the anneal. And again much is insured in the quality of metal by the time allowed the furnaces to cool down. The only chance for material change in the anneal is the small operation or reaction due to charging packing with sal-ammoniac, etc., and this action will be uniform. There are times when some of the iron charged into ovens will be perfectly annealed, while other parts will be hard iron, but this would seem a faulty construction rather than inequality of metal. In an oven, when the anneal is uniform, it is impossible for some iron to be burnt and the balance to be found in perfect condition. Beyond a certain set limit the annealing furnace has no power whatever to influence the complexion of metal. A furnace may be driven hard enough to cake all the packing, yet the iron has been very ductile indeed. This phase is often met with. Annealing ovens may be fired with any material, which will furnish the degree of heat required. Coke, coal, oil, natural and producer gas, all work satisfactorily. In general practice the heat required is between 1,500° and 1,900° Fahr.

The Republic Iron & Steel Co. has purchased from the South Chicago Furnace Co. all the machinery and other apparatus belonging to the rolling mill plant of the old Calumet Iron & Steel Co., at Cummings, Ill. The purchasers are dismantling the plant and will remove everything of value to other works which they own. A considerable part of the machinery will be removed to East Chicago, Ind., to increase the capacity of the works at that point.

FOUNDRIES ON UPPER FLOORS.

Not many years ago it was the universal practice to locate foundries on the ground floor. The first deviation from this was in large cities, where land values were high, and this led to the occasional employment of a basement for foundry purposes. In this case artificial light was employed. This plan was never satisfactory. Molding requires good light, better light than can be afforded by artificial means. Furthermore, the air of the basement is not good, and a civilized man won't live in a cellar if he can help it. True, many forms of industry are prosecuted in basements, but the peculiar conditions pertaining to iron founding render it one of the least fitted for subterranean location. Moth and rust gather fast in underground places, and this circumstance is greatly aggravated by the varying temperatures, and by the gases and steam of the foundry. The underground foundry was, at a stretch, barely practicable in times past, when competition was a baby; but now that this interesting person has grown to athletic proportions, and never for a moment lets up in his war against abnormally high profits, the basement foundry is no longer "in it." The economies possible in high, dry, airy and well-lighted foundries have knocked out the cellar. Another thing: You couldn't get molders to work in such a foundry today.

The foundry is passing from the ground floors to the upper floors today, and it is nothing at all uncommon to see a foundry on the second floor, and some go even higher than this. And why should they not? There is nothing whatever in the way of it. Of course, very heavy work can be done with greater advantage on the ground floor; but all sorts of light work, including general agricultural machinery, may be done on the upper floor with equal facility. The floor in such a foundry may be made of either brick or cement; I should consider the latter preferable.

The new foundry of the Moline Plow Co., at Moline, Ill., is a splendid example of modern costruction. It is a steel skeleton, with brick walls, tile roof and cement floor, the latter laid upon arched, corrugated sheet steel, the ends of the arched sections resting on the lower flanges of I-beams, spaced about five feet apart. It is a two-story structure, 150x175 feet. The molding room is on the upper floor, the cupola standing upon a brick pier extending up from a base of concrete in the ground below. The engine is on the ground floor, and here also are stored the iron, coke, sand and all raw materials; also flasks, follow boards, etc. The cleaning, inspecting and finishing of castings is done on the first, or ground floor. A large elevator lifts the stock and other things to the foundy room, or to the cupola scaffold, but the casting product is shot down through the floor on an incline to a raised floor, from which it is placed in the tumbling mills, which are on the ground floor. In this way the available room is double what it would be by the old style of construction, while general convenience and comfort are much greater. The first story is very high, giving room for a double row of windows, and this raises the foundry proper, or molding room, high above the dust and noise of the street, and gives abundance of light and air, the principal wall space being constituted of windows, the M-roof having two very wide and high ventilators extending the full length of the building. There are many other advantages in a foundry of this construction. No insurance is required, for there is nothing about the building that can burn except the windows. And not least among the agreeable features is the difficulty of access by persons who have no business on the premises.—[E. H. Putnam in Tradesman.

Coatings for Metals.

"Protective Coatings for Iron and Steel" was the title of a paper by A. P. Lane before the 30th annual convention of the Master Car Painters' Association held at Philadelphia, Sept. 12–15. The writer had had good results from a mixture of linseed oil and mineral brown. He had tested it with graphite on bridges. Pure graphite was undoubtedly good, but it is liable to be adulterated with silica, which has no wearing properties, alhtough it is a good filler. The discussion showed a concensus of opinion that oxide of iron, graphite and carbon are the best pigments for painting on iron and steel.

PNEUMATIC HAMMER.

A form of pneumatic hammer, in which recoil has been overcome and automatic lubrication provided, subject constantly to the control of the operator, has been designed by J. V. Pickles, of 4539 Cook ave., St. Louis. We give a half-tone view of the complete hammer and a sectional view which will give a clear idea of its construction and method of applying power. The construction is such that all parts of the hammer may be reached by removing the plug at the end, this serving the double purpose of closing the cylinder end and holding the handle and cylinder in place.

lubricant is fed into the path of the incoming air in measured quantities when the throttle is open or when the hammer is operated, and at no other time. Thus lubrication is effective, in that it extends to all the parts reached or operated by the air; at the same time it is economical, the consumption of oil being only in such quantities as are necessary. This method avoids the objectionable feature of introducing oil in quantities at such points as are in communciation with working parts, to be immediately discharged on the first admission of air.

The throttle construction is such as to control the air supply and at the same time the lubricant, with but a single movement of the trigger. The opening to the oil reservoir

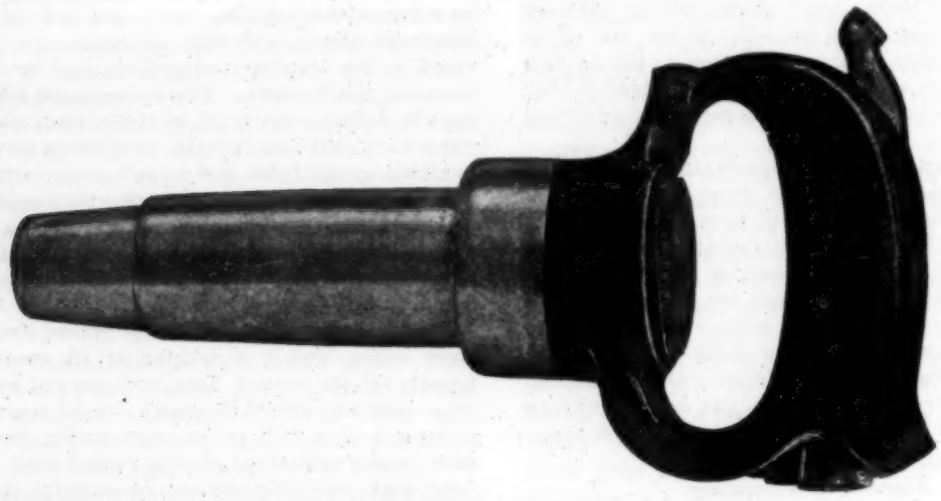


FIG. 1.—PICKLES PNEUMATIC HAMMER.

There are two moving parts, the valve and the piston, with large posts forming air passages by which the moving parts control each other. The cylinder is of one piece throughout its length and the piston has bearing the full travel. Upon the outer surface a cylindrical differential area valve has its seat withn the valve block, one end of the valve being exposed to constant pressure to move it in one direction, while the other end is exposed to intermittent pressure controlled

is controlled by a small valve held closed by a spring and opened by pressure of the nose of the oil can.

THE York Safe & Lock Co., of York, Pa., manufacturer of bank vaults, safes and locks, has introduced improvements in the construction of burglar-proof safes and bank vaults which render them secure against modern tools and explosives. It is a matter of record that none of the company's

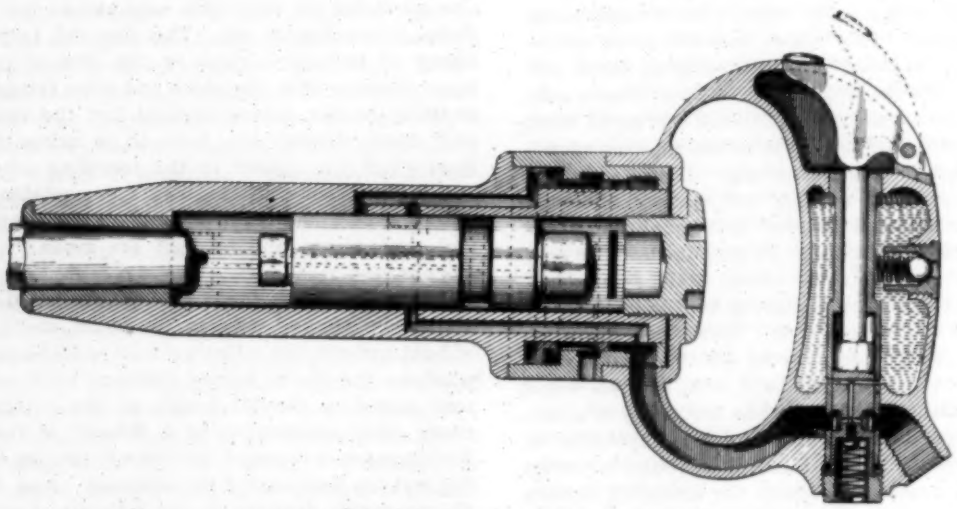


FIG. 2.—PICKLES PNEUMATIC HAMMER IN SECTION.

by the piston. There is a positive return of the piston to the backward position by the passage of motive fluid through it to the lower end of the piston chamber, while the annular groove is passing the live air passage. The balance of the stroke is completed by the expansion of the air so admitted. Upon the return of the piston the extension upon it enters the counter-bore in the plug and serves to cushion it; at the same time only a small area of the piston is exposed to the incoming high-pressure air, to give the initial movement forward, and by the coaction of the parts the recoil is overcome.

The automatic lubricating device secures the storage of a sufficient quantity of oil in the handle for a day's work. The

safes has ever been successfully operated upon by burglars. A constant advance in methods and in manufacturing processes has been maintained. The safes of the company have solid welded angle frames, round corner, frictionless screw and ball-bearing hinges, quick-acting worm gear pressure bars, cut-off spindles, anti dynamite devices, etc.; and an important consideration is that the locks used on the York safes and vaults are manufactured in the same works. Some of the largest and most massive bank and safe deposit vaults in the country were manufactured at the York plant. Israel Laucks is president and treasurer of the company and S. Foory Laucks, manager.

WASTE HEAT BOILERS AND WATER REGULATION.

The disastrous explosion of a waste heat boiler which occurred recently in one of our largest mills serves as a lesson that all is not clear gain The tendency of the times is to let nothing go to waste, yet while doing this, and doing it successfully, it often happens that mill managers lose sight of certain points and follow what may properly be styled a "penny wise and pound foolish" policy, by neglecting to avail themselves of approved appliances which are in successful use and have been for some years past, as a safeguard against just such accidents as the one referred to, which killed a number of men, injured others, and caused a stoppage of work and loss of property the value of which has not yet been fully estimated.

The writer calls to mind some few years ago an instance where a very prominent manufacturer called him up in regard to the proper equipment of a boiler which he was about to place over a heating furnace. The steam pressure was 120 lbs. per square inch, and he proposed to connect the boiler up to the common steam main leading from the other boilers of the works. This was their first venture in the matter of waste heat boilers. The writer explained to the manufacturer the difficulty of carrying a safe water level, as the boiler was of the fire tube type, and advocated the adoption of a certain device of feed water regulator made by one of the oldest firms in the city of Pittsburg, stating at the same time that he had seen a number of these machines in successful operation, and had also heard well known firms speak highly of them. The manufacturer answered that he did not believe in any automatic device for the regulation of the water fed to a boiler, as in his mind it would tend to make men careless. In reply the writer said: "My dear sir, according to your theory, then, you would bar the safety valve and steam gauge. You would do away with the air brake, through which you can compose your mind and ride in safety to New York or San Francisco. You would want to go back to the days of the Conestoga wagon." The writer explained that beyond being a safeguard against low water, the feed water regulator would pay as an investment by keeping a uniform water level in the boiler, thus saving fuel and securing dry steam for use in the engines.

Now this man knew that the heat applied to the boiler in this class of work would not only be intense but fluctuating, so that it would require especial attention on the part of the water tender, yet he thought that the same attendant that already took care of a battery of boilers in another house some 200 feet away could very readily go over now and again and try the gauge cocks in the waste heat boiler. The writer did not have any further conversation with the gentleman that day, as the conversation was interrupted, but the next day the firm who made the feed water regulator called up the writer by telephone and thanked him for the interest taken in their machine, saying that they were in receipt of an order from the manufacturer in question. It is strange that the average mill manager looks with suspicion on just such devices, and the writer knows of cases where it has taken years before any returns have been made or any recompense afforded for the time spent in trying to secure the adoption of just such safeguards against the inattention of steam boiler attendants.

Again, how many times do we see one man for a stretch of 12 hours taking care of five or six waste heat boilers, not having time even to sit down to his lunch, but kept on the run from one boiler to another to regulate the water supply. Perhaps these boilers are rated at 150 h. p. each. Now, while the iron in the furnace is taking up the heat generated, the 150 h. p. boiler might not be doing over 40 h. p. work, the feed valve being set for this evaporation. Twenty minutes from this time, the iron having taken up the heat, the boiler is driven away beyond its rating, necessitating quick action on the part of the water tender, else the small quantity of water held will flash into steam and a burnt boiler will be the result. Right here is where a positive automatic feed water regulator comes in play; one that will meet with promptitude each and every demand that is made upon it.

Another thing which might be mentioned in connection with waste heat boilers, especially those of the vertical type, is the poor means often provided for the water tender to reach the water columns for the purpose of properly blowing out. Often the writer has seen men climbing over a lot of girders and beams to reach the upper portion of the boiler, which is frequently 35 feet from the floor line. A good wide platform should be provided in all cases, so that men will not endanger both life and limb in attending to their legitimate work. It is often this dread that deters men from properly taking care of the most important part of a steam boiler—the water column and its connections. ENGINEER.

Pittsburg, Sept. 25, 1899.

NAVAL PROGRESS OF THE UNITED STATES.

TO THE EDITOR:

In its special issue of Sept. 29, commemorating the return of Admiral Dewey and the new strides of our navy, the *Marine Review* will say:

"The full strength of the navy of the United States now amounts to 312 vessels of all kinds, built and building Of this number 189 are in the regular navy and 123 constitute the auxiliary force, for the accumulation of which we are largely indebted to the necessities of the Spanish-American war. Something of the pace at which we are moving forward may be imagined when it is stated that roughly estimated the existing naval fleet represents an expenditure for construction of about $125,000,000, and yet there are now under construction or awaiting formal acceptance by the Government more than half a hundred war vessels, the contract price for which, exclusive of armor and armament, is in the neighborhood of $40,000,000. The war almost doubled the aggregate of men on our war vessels. At its outset the complement was 12,500 men, but in the summer of 1898 it reached the maximum figure of 24,123 men. Since that time it has of course decreased considerably, but the incoming Congress is expected to authorize a permanent naval strength of upwards of 20,000 men. Nor, in passing, should mention be omitted of the success which has attended the amalgamation of the line and staff. An experiment, watched by students of naval administration everywhere, its beneficial effects have been discernible instantaneously.

"For the future, bright hopes may be based upon the most favorable of indications. Congressmen have been spending the summer of 1899 in the study of naval science abroad. Places on the naval committee have been eagerly sought. Already a new atmosphere of liberality and intelligence characterizes the consideration of naval problems and affords ground for hope that never again will the march of progress be retarded by such a lack of knowledge as made possible the late fiasco relative to the limitation of armor prices. New battleships, armored and protected cruisers are to be constructed. Each class is quite certain to mark a step forward in the science of building vessels of war. Rear Admiral George W. Melville declares to the *Review* that the new battleships should be of 20 knots speed; that they should carry large batteries of rapid fire guns; have ample coal bunker capacity and be fitted with triple screws—radical revolutionary measures, all, but vital in influence if successful. Already the eyes of every naval officer across the Atlantic are upon us. Within the past month two of our new battleships have exceeded contract speed. The practicability of that most novel of ideas—the superinduced turrets of the Kearsage—will soon be put to the test. We are preparing to outdo the British in the thoroughness of our experiments with liquid fuel and wireless telegraphy. Finally we are investigating the possibilities of the submarine boat and our conclusions will have enhanced value because they will be characterized by neither the enthusiastic optimism of the French nor the cynicism of the conservative Britons."

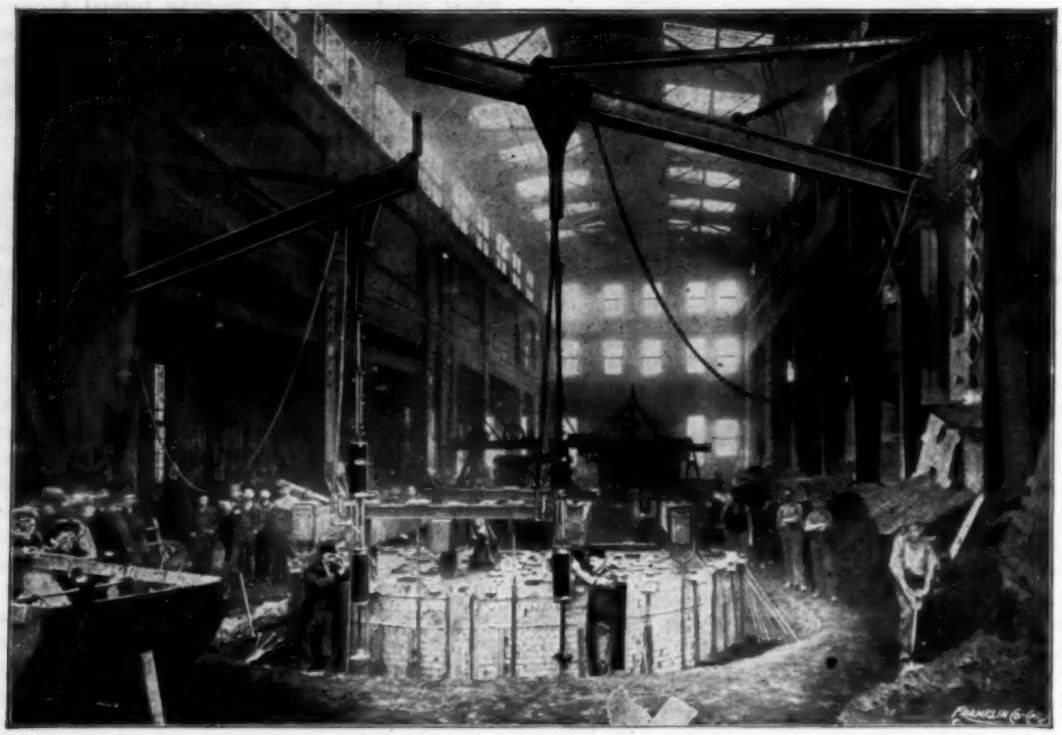
Charcoal Iron Still in Favor.

In spite of all that is said about the decadence of the use of charcoal iron it is curious to note that whenever some important job of exceptional note looms up, the specifications say that altogether or in part, the castings must be made from charcoal iron. Against all the techincal discussions denying the superiority of charcoal iron, practical foundyrmen still grant it first place and furnish it when the customer is willing to pay the price as many find it economy to do.—[The Foundry.

CRAMP PNEUMATIC RAMMER.

A paper read before the Foundrymen's Association at Philadelphia, describing the Cramp pneumatic rammer, appeared in these columns some time ago. The half-tone cut below shows this rammer as in use in the foundry of Wm. Cramp & Sons Ship & Engine Building Co. at Philadelphia. It is the invention of Joseph C. Cramp, of the Cramp company, and is manufactured by the Chicago Pneumatic Tool Co., of Chicago.

The rammer can be run by compressed air or steam, preferably the former, and is used for ramming up the pits about a loam mold or to ram up the pits after the casting has been taken out, either loam or green sand work. Any shaped tool can be used on it to ram up a mold, or break up the ground, saving digging, or for bedding in a casting. It can be adapted to ramming up cast iron water and gas pipe; used by contractors in both digging stone and ramming up trenches or for pounding stone or concrete; or in boiler shops or metal works for straightening plates, etc. Any laborer can turn on the air and guide the rammer. It is generally hung on a portable wall or post crane, that can be moved from place to place. It consists of two vertical cylinders held apart by stanchions containing pistons driven by compressed air or steam, which is regulated by a simple, ingeniously contrived



valve. The cylinders are 3½ inches diameter by 4 inches stroke. With an air pressure of 35 pounds per square inch it strikes 200 blows per minute, light or heavy, as may be desired. Power is supplied by a flexible hose tapped from the main pipe. It strikes a blow of 300 pounds or less, as desired; one turn of the rammer raises or lowers it ½ inch, which is readily accomplished while in motion. The rammer complete weighs about 675 pounds.

A large loam mold which usually took three days was rammed up with this machine in the Cramp foundry in 11 hours. They had ten of these castings (pump cylinders) to make. The time saved in floor space alone was 20 days, with increased capacity of the core ovens in the same proportion. Any deep casting rammed up with this machine will be less in weight than if done by hand. The illustration shows the rammer fitted with the 9-inch diameter butt, which is equivalent to more than 40 hand rammers.

The Chester Rolling Mill Co., of East Liverpool, O., now building a rolling mill, has elected the following officers: President, C. W. Tindle; secretary and treasurer, W. N. Voegtly; directors, C. W. Tindle, J. R. Tindle, Oliver Bergman, William Banfield and Charles McKnight.

AMERICAN STEEL & WIRE CO.'S COPPER GOODS.

The American Steel & Wire Co., contrary to the impression which might be created by its name, is not confined to the production of iron and steel wires or their products. By the absorption of the Washburn-Moen Mfg. Co. the larger organization inherited one of the world's most important manufactories of bare and insulated copper wires in various forms and for all electrical purposes.

At the plant at Waukegan, Ill., 35 miles north of Chicago, much of the copper wire is produced, giving the American company exceptional facilities for supplying the wants of the trade in the West, giving it the same prestige in occupying the Western field that is enjoyed by the Washburn-Moen department at Worcester, Mass., in Eastern territory. These statements no doubt will be news to many of our readers, the recent changes in the industrial world having been so numerous and kaleidoscopic that many, even among the large users of this company's products, have not become familiar with the new scope of its operations.

In every line of production certain names come to stand out as synonyms for some forms of excellence. In the production of electrical wires, bare and insulated, in the introduction of improvements calculated to secure best results, and in uniformity of excellence, no name has ever stood higher than that of Washburn-Moen. The merging of this company in the American Steel & Wire Co is simply a further step in the lead, whereby with unlimited resources, assurance is given of continued investigation and improvements and a still greater superiority in the production of all forms of electrical wires, rail bonds, etc. At the Waukegan plant special attention is given to the manufacture of the well known "Extra BB," "BB," and "Steel" telephone and telegraph wires and copper wires for electric lighting and street railway plants in all their forms. The system of tests at every stage of the manufacture of these goods is unique and rigid, and a guaranty that the high standard set for all the products of this company is maintained. A study is made of the purity, conductivity, tensile strength, finish and uniformity to gauge, resulting in the output of millions of pounds, distributed throughout the world in the operation of great telephone, telegraph and electrical traction systems.

In the production of copper rail bonds, either solid or flexible, the prestige of the Washburn-Moen name has been added to since the formation of the American Steel & Wire Co. The output of solid and flexible "Crown" bonds in a variety of patterns and for adjustment to the rails in various positions is especially noteworthy. Similarly, in the manu-

facture and sale of copper trolley wire, the company has earned a commanding position. In the department of insulated wires, the entire line, including every form of magnet wire, office and annunciator wire, weather proof wire, feeder wires, lead-encased wires and cables, and submarine cables is thoroughly covered, the rubber insulating, taping, braiding, lead-encasing, armoring and weather-proofing being carried on under the supervision of the most expert scientific skill and experience. The general offices of the company are located in The Rookery, Chicago, with branch offices in New York, Worcester, San Francisco, St. Paul, St. Louis, Cleveland, Denver and other cities.

THE SUPPLY OF MECHANICS.

In a recent installment of his series of articles on "Machine Shop Management in Europe and America," published in the *Engineering Magazine*, Mr. H. F. L. Orcott asks if the advantages, which he owns American shops now enjoy, are likely to be permanent, and he answers his own question in the negative. His reason for thus answering the question lies in the increased specialization of American shops, with the tendency which accompanies this specialization to train up boys to be mere machine tenders or operatives instead of mechanics in the proper sense of that term. In other words, Mr. Orcott believes that the very system which has given us our present position will in the end, by a process of reaction, destroy the very thing which it has created. He considers that the present American system of manufacture is the outgrowth of the conditions which preceded it—social conditions which developed independence of thought and enterprise in action, technical conditions which trained up a body of superior mechanics, and economic conditions which gave to this combination of enterprise and skill full play in business development; the result being what we see about us. There is no reader of the *American Machinist* who cannot count up a goodly number of men who now occupy the front rank in a business sense and who began life in the shop earning their daily bread. It is no uncommon thing to hear men who occupy positions which any one might envy speak of the time when and place where they "served their time." It is such men as these who have laid the foundations and built the superstructure of American manufactures, and they form one of the glories of America. Mr. Orcott evidently does not consider that the conditions which have produced this race of men now exist. Nor, going down the scale, does he consider that under present conditions are successors being trained to the lieutenants and privates without whose aid the efforts of the leaders would have been comparatively fruitless. In other words, he does not believe that the present condition of things is self-perpetuating. We are, so to speak, in his opinion, in the condition of a man who is living on his capital which was accumulated by the generations before him.

Mr. Orcott is not the only one who holds these pessimistic views. Reading between the lines of Professor Sweet's Rochester address, published in our last week's issue, it is hazarding little to surmise that the professor holds similar views.

There is already a marked deficiency in the supply of foremanship talent. We frequently hear of openings of this kind which fairly gape to find an occupant. As industries develop and become more highly organized, a higher grade of talent in these positions becomes necessary for them; but, on the other hand, this very process of development on more highly organized lines tends to restrict the growth of the very qualities for which it sets an increasing demand.

The world is full of failures of one generation to anticipate or to attempt to solve the problems of the next. One may be convinced of the truth of these opinions and at the same time be optimistic as to the ultimate outcome. The great forces of industrial and social progress are almost as much beyond the control of man as the forces of physical nature, and for ourselves, even granting the situation to be as described, we do not fear the outcome or believe it will be what strict logic may indicate. There is such a thing as carrying logic too far. We all know men who are so minutely logical as to become in the end illogical. Nothing, in fact, is so unsafe as the application of the strict rules of logic to diverse and uncertain premises, whose relative importance and bearing upon one another cannot be known.

How the situation will or should be met we do not profess to know. Professor Sweet obviously believes the correct solution to lie in the trade school. We have no shadow of doubt that a trade school conducted on the lines laid down by him—such a school, in fact, as he might conduct—would successfully train competent mechanics. Nay more, we believe it would train better mechanics than even the old system, except in exceptional cases, like that of the professor himself; for few apprentices, even in the palmy days of apprenticeship, had as good and capable a "boss" as he. We very much doubt, however, the advisability of the establishment of such schools by state aid. This, not because such use of state funds is improper, for we regard it as eminently proper, but because state schools of this kind would be part of the educational system of the state, and as such would be controlled by those who have been bred in the present scholastic atmosphere. The inevitable result would be the assimilation of the work of the trade schools with that of the present educational system. The very opposite of this is necessary. The old grooves must be left behind and new ground must be broken if the highest success is to be attained. We could point out at least one great educational experiment which was a flat failure largely because the new idea was made the tail to an old kite.

This whole subject of industrial education is in its infancy, at any rate in this country. By common repute Germany leads in educational development on these lines. We have too little knowledge of the German schools of technology to speak of them with much confidence, and it may or may not be true that they might be transplanted to this country and be found in harmony with the new environment. We in this country have been reared to almost worship the little red school-house as the foundation of our institutions, but it should be plain to all that new conditions demand new treatment and that new wine should be put into new bottles. Despite the orthodox belief to the contrary, the wisdom of the world is not all to be found in its books, and the glorification of education, as that word is commonly understood, may easily be carried altogether too far.—[American Machinist.

THE MONARCH GOVERNOR.

With many different types of engines in use, working under varying conditions, the desideratum has been a single type governor which can successfully govern all types of engines. The special feature of the Monarch governor, emphasized by its manufacturers is its adaptability to all types of engines. It has been constructed so that the throw of the valve may be

adjusted independently of the throw of the governor balls or other speed-controlled mechanism. This, too, without affecting the normal speed of the engine. Thus for a given radial movement of the governor balls, the valve throw may be made greater or less, according to the conditions resulting from the particular type of the engine or from the peculiar circumstances under which the engine may be working. The automatic stop of this governor is positive and is adjustable to any angle of the driving belt, whether horizontal or vertical. Spceial valve chambers are fitted to these governors, when required.

The manufacturers are the Monarch Governor & Machine Co., Inc., 740-750 E. Washington st., Indianaplis, Ind.

LITTLE GIANT MOLDING LACHINE.

A molding machine in which the patterns are drawn from the sand, instead of the flask being forced from the patterns, is manufactured by Thos. Furlow & Sons, of 3218 Frankford avenue, Philadelphia. It is designed to take a flask 16½x13¾ inches and the floor space required for operation is two feet square. A feature of the machine is the automatic rammer and tucker, operated by a stroke of the hand. What the manufacturers term a "spider motion" is secured, which prevents breaking down, in placing the rammer and tucker in operation. The construction of the machine is such that plates and flasks are all interchangeable.

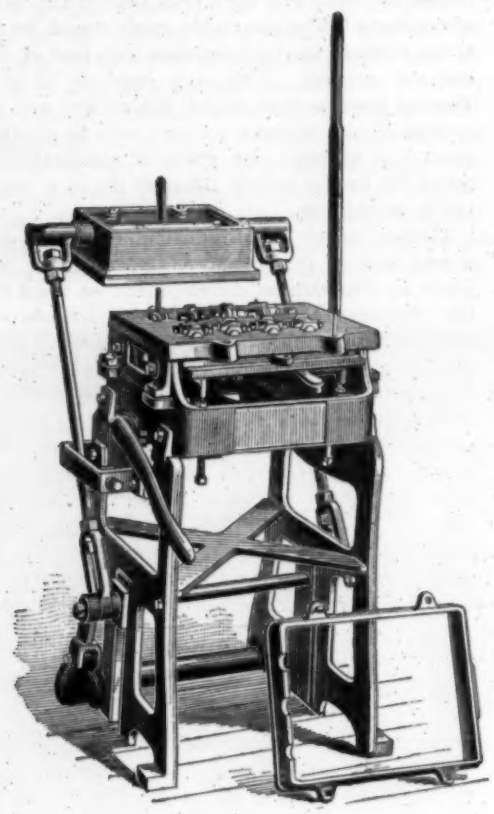


FIG. 1.

The operation is in brief as follows: After placing the stripping plate or draw plate of the casting desired, the operator raises the small lever on the side of the machine. This places the patterns in position for molding. The lever in front is pushed toward the right, locking the pattern and preventing any cracking of the face of the mold. The flask having been put in position, the sand is thrown in, the tucker box brought over and the large lever on the side pulled down. As the box is made with a loose bottom it tucks the mold as is done in hand molding. A blow on the top of the small lever makes the tucker box solid. The tucking operation is repeated, except that in letting the tucker box go back the operator takes hold of the strike-off and lets the box return. This takes off all the extra sand and leaves a smooth surface. As the board is put on top of the flask the front lever is pulled to the left and the side lever is pulled down. This draws the patterns. The flask is then lifted off the machine and a mold is left that is uniform in ramming, properly gated and vented, with no rapping to get the patterns out of the sand. The time required for all these operations is from three-quarters of a minute to a minute.

Recent improvements upon the machine consist of the automatic strike-off, not shown in the illustration, but referred to above as being operated as the rammer is placed back in position after use. A table has also been attached to the machine, to receive the flask after it has been lifted off the machine and is ready for cores, blowing-off and flouring. This saves time in walking back and forth to table or bench.

FIG. 2.

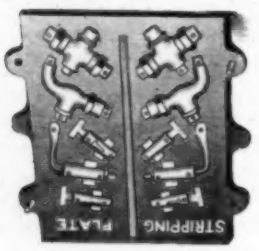


FIG. 3.

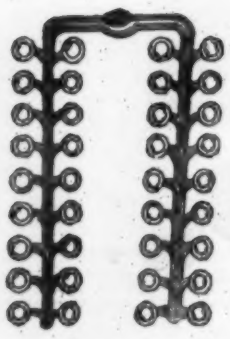


FIG. 4.

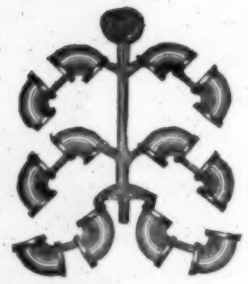


FIG. 5.

FIG. 6.

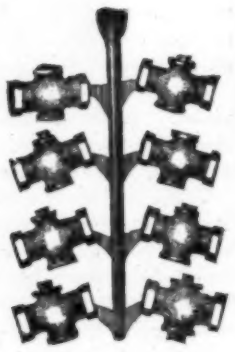


FIG. 7.

The machine has a capacity of 30 flasks an hour with core work. Snap flasks may be used on the machines for iron foundries. Fig. 1 gives a view of the machine. Fig. 2 shows the result of one minute's operation–the flask gated and vented. Fig. 3 illustrates the stripping plate which canbe used on some work with as good results as with draw plates. Fig. 4 shows ½-inch condenser nipples, 36 in a flask; Fig. 5, ½ inch elbows; Fig. 6, ½-inch tank valves; Fig. 7, ¾-inch stop bodies. The machine is adapted to iron, lead, brass and steel founding.

The Battle Creek Steam Pump Co., at Battle Creek, Mich., has changed its name to the American Steam Pump Co.

INDUSTRIAL SUMMARY.

[I you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The Dimmick Pipe Co., whose incorporation has been announced, has elected D. R. P. Dimmick, formerly manager of the Anniston Pipe Works, president, and C. Blair secretary. Among others interested are: F. D. Dimmick, James Bowron and P. G. Shook of the Tennessee Coal, Iron & Railrod Co. The company intends erecting a 100-ton cast iron pipe plant. It will cost about $150,000. The company has offers of several sites and Anniston has offered, in addition, a cash bonus of $10,000. It is likely that the plant will be located at Bessemer, Ensley or Birmingham.

The Oscar Barnett Foundry Co. has been incorporated by Gerald Hannay, of East Orange, N. J.; Albert D. Barnett and Oscar Barnett, Jr.

The Standard Seamless Tube Co., Pittsburg, is being organized with $500,000 capital, and will shortly apply for a charter under Pennsylvania laws. The incorporators are Charles E. Pope, John H. Nicholson, William McKelvy, Herman G. Veeder and J. E. McKelvy.

A movement is on foot to establish a malleable iron plant at Meadville, Pa.

The Hillman Ship & Engine Building Co., who are to take over the plant formerly occupied by the Charles Hillman Ship & Engine Building Co., of Philadelphia, will pay $525,000 for the plant, which out of the $750,000 stock will leave $225,000 as a working capital. The works are in complete order and can be started at any time, and are capable of building a ship 350 feet or more in length. A charter was granted the company Sept. 15, with nominal capital of $20,000. The directors are C. A. Gurney, Brooklyn; C. A. Barnes, Philadelphia; A. T. Rush St. David's; M. L. Tyroler, Philadelphia, and H. E. Anderson, Norristown.

The Maryland Car Wheel Works, of Baltimore, has been incorporated, with a capital stock of $500,000, by N. T. Bonton; A. G. Wellington, of Chicago; E. J. Tilkman, J W. Stuart and H. R. Preston, of Baltimore.

Kentucky Folding Crate Co., Bowling Green, Ky., will purchase a planer, 18 to 24 inches; one metal lathe, screw-cutting, with 12 to 14-inch swing, new or second hand.

The Dimmick Pipe Co., Anniston, Ala., is figuring on patterns for pipe and special foundry work, also on pipe flasks, etc. The company will buy electrical machinery and material necessary for equipping a 100 ton cast iron pipe works, including wrought iron core barrels, etc.

The Massillon Iron & Steel Co., of Massillon, O., has been incorporated for the manufacture of cast iron pipe and heavy castings. Contracts have been let for a main foundry building 250 x 100 feet, machine and pattern shops, each 100 x 30 feet, and a power house 40 x 50 feet. Electricity and compressed air will be employed to operate the plant and a complete system of railroad tracks will deliver material at a height of 26 feet above the foundry floor. The plans adopted provide for adding to the foundry as requirements warrant. Twenty-three acres of ground are included in the site chosen and it is the plan to make every provision for the greatest economy in handling material. C. M. Russell, secretary of Russell & Co., is president and treasurer of the new company. C. L. McLain is vice-president, and H A. Croxton secretary and general manager. The directors are C. M. Russell, J. W. McClymonds, C. L. McLain, C. O. Heggem, H. A. Croxton, all of Massillon, and S. W. Croxton, of Cleveland.

New Construction:—

The Youngstown Bridge Co. has contracted with the Acshman Steel CastingCo., of Sharon, Pa., for the erection of an iron and steel addition 54x160 feet to the latter's plant.

The Blymyer Iron Works, Cincinnati, will build a machine shop and foundry to cost $75.000. The building will be 166 x 222 feet, one and two stories.

George E. Deitrich is building a machine shop at Nicetown lane and Reading Railroad, Philadelphia, for the Midvale Steel Casting Co. It will be of stone and steel, one and one-half stories, 60x112 feet 10½ inches. Estimated cost, $10.000.

The Ingersoll-Sergeant Drill Co., Easton, Pa., is about to make extensive additions. The new main building will be 700 feet in length and 96 feet wide. A 500-ft. foundry and a 190-ft. warehouse will also be erected. The construction and equipment will cost $300,000.

The Pusey & Jones Co., Wilmington, Del., is building a pattern shop and fitting shed, 38x114 feet, to cost $7.500.

The Hendey Machine Co., of Torrington, Conn., has let a contract for a new foundry, 83x170 feet.

The Woonsocket Machine & Press Co., of Woonsocket, R. I., is enlarging its plant.

W. E. Ewing, Nashville, Tenn., will erect a 2-story brick foundry to cost $5,000.

Bids closed Sept. 25 for the new foundry and machine shop of the Lane & Bodley Co., Cincinnati, to be built at Bond Hill or Norwood 'O. It will be 120x200 feet.

The Hempfield Foundry & Machine Co., of Greensburg, Pa., is building an addition of 30 x 110 feet.

The Wilson Foundry & Machine Works, of Athens, Ga., will resume operations.

Gardam & Son, machinists, have begun the building of a plant, 50 x 200 feet, at New Orange, N. J.

W. Oesterlein & Co., Cincinnati, manufacturers of milling machines, have purchased a lot on Spring Grove ave., south of the Mills & Smith machine tool plant, and will erect a large building.

The Berlin Iron Bridge Co., of East Berlin, Conn., has the contract for furnishing the structural steel work for three buildings for the Ottawa Carbide Co., of Ottawa, Can. The buildings are from three to five stories high, and consist of a furnace building 80 feet wide and 286 feet long, a grinding room 38 feet wide and 80 feet long, and a breaking room 35 feet wide and 80 feet long and two stories high. The floors are carried on steel beams and columns, and the floorings steel plate. The trusses have a clear span, and the roofing is corrugated iron. The bins for the storage of material are all of plate iron. No wood work is used anywhere in the construction of the buildings.

The Standard Malleable Iron Co., Muskegon, Mich., will erect another large building, to be utilized in part as a core and storage room. The present core room will be added to the foundry. The proposed building will be 100 by 50 feet. The company also expects to erect a smaller building for other purposes.

The Royersford Machine Co., of Royersford, Pa., is enlarging its plant.

The Oil Well Supply Co., at East Oswego, N. Y., is about to build a new boiler shop.

North & Judds, of New Britain, Conn., have begun the building of a 68 x 90 ft. foundry addition.

The Pittsburg District:—

The Mesta Machine Co., of Pittsburg, has an order from the Cambria Steel Co., Johnstown, Pa., for large slabbing mill tables. The housings and portions of the mills will be of cast steel, the housings weighing about 25 tons each. These tables will be made at the company's new shop at West Homestead, which will be put in partial operation early next week.

The new cold-drawn shafting plant being put up at Rankin by Thomas W. Fitch, Jr., and others, of Braddock, is nearing completion. The main building is 100 x 175 feet. The contract for the engine and compressors was recently awarded the Atlas Engine Works, Indianapolis, Ind. The shafting machinery will be furnished by the Brightman Mfg. Co., Millersburg, O.

Changes are to be made at the Schoenberger plant of the American Steel & Wire Co. that will cost $49,000. A one-story iron building is to be built to take the place of one of the old mills. It will be 140 x 250 feet and the structural iron work will cost $34,000. The company will also erect a two-story ironclad building, 18 x 120 feet, for gas producers, at a cost of $7,000, and a new blooming mill building, 110 x 96 feet, one-story high, costing $8,000.

Representatives of the Pittsburg Federaton of Churches called upon President Schwab of the Carnegie Steel Co., Ltd., recently, and asked him to have Sunday labor in the mills of his company reduced to a minimum. He said that this was the aim of the company, which had only a small percentage of its men at work on Sunday. "We attempted once," he

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High Pressure Pattern. Horz. Pipe.

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Side Section.

HARRISON SAFETY BOILER WORKS, Clearfield & 17th Streets, PHILADELPHIA, PA.

added, "to shut off the Sunday work altogether in our mills, but the attempt was a failure. The attempt cost the company a million dollars for the reason that our competitors would not do the same thing. We were thus handicapped and had to abandon the idea."

The Duquesne Mfg. Co., of Pittsburg, recently organized to manufacture stoves, will operate independently of the consolidation of stove manufacturers formed at Pittsburg last month. The company bought the plant formerly operated by the Kensington Foundry Co. at New Kensington, which had a capacity of six tons of castings per day. This will be enlarged to 10 tons per day, and the manufacture of gas stoves and ranges will be begun, but the product will include coal stoves also. The castings will be turned out at this plant, while the mounting and machine work will be done at the present establishment of the Duquesne Mfg. Co., 26th street and Liberty avenue. This factory is equipped with the most improved machinery for mounting and ornamenting stoves, which includes enameling and plating departments with all the facilities for the fine finishing work. Natural gas developments have created a great demand for gas ranges, a large percentage of the stove trade in the gas districts being in appliances for using this fuel. The Duquesne Mfg. Co. includes among its directors John R. McGinley, W. L. Abbott, E. W. Mudge, H. Prescott Simpson and other well known Pittsburg men. Mr. Simpson is secretary.

The Pittsburg Iron & Steel Co., Pittsburg, Pa., is applying for a Pennsylvania charter, the proposed incorporators being J. N. Pew, Arthur E. Pew, W. S. Miller, T. S. Bigelow and Frank Cross. It is stated that no special effort has been made to raise the capital necessary for the erection of the plant, and it is given out that no plant may be built, the question hinging on the continuance of high prices for pipe and casing. Those at the head of the movement are largely in the oil and gas business.

The mass meeting of puddlers in Pittsburg last Saturday night accomplished nothing. There was a general airing of the dissatisfaction at there having been no advance in the puddling rate at the last bi-monthly settlement. It seems to be better understood than at first that there can be no ground for dissatisfaction except at the scale put in force at the beginning of the scale year, which, however, was about all the men were in a position to ask for. A further mass meeting will be held shortly, and it seems likely that steps will be taken to demand a large advance next June in the new scale.

The bi-monthly conference on the sheet workers' scale was held in the offices of the Manufacturers' Association in Pittsburg last Saturday. The manufacturers were represented by the secretary of the association and the workers by Secretary Williams, of the Amalgamated Association, and two workers. The sworn returns of the manufacturers showed that no advance was yet in order. An advance of 2 per cent is to be paid when the actual average selling price of shipments during two months exceeds 3.10c a pound for gauges 26, 27 and 28, and 2 per cent further advance for each additional advance of 10 cents a hundred.

Louis Gerber & Sons will remove their Black Diamond tool works from Allentown, Pa., to Aliquippa, Pa., having purchased the property of the old Aliquippa Tin Plate Co., which went out of business some years ago.

The Oliver & Snyder Steel Co. has just completed the foundations for 80 additional coke ovens at Oliver Station on the B. & O. railroad, in the Connellsville region. When these ovens are completed the company will have 700 ovens, the product of which all goes to the National Steel Co. for a term of years.

Chicago District and Northwest:—

The McHugh Foundry Co. has been incorporated at Chicago, with a capital stock of $5,000, to do a general foundry, steam fitting and machinery business, by Newton Eastman, Harry A. Daugherty and J. E. Michelson.

The planing mill of the Illinois Car & Equipment Co., at Hegewisch, Ind., was destroyed by fire Sept. 20, causing an

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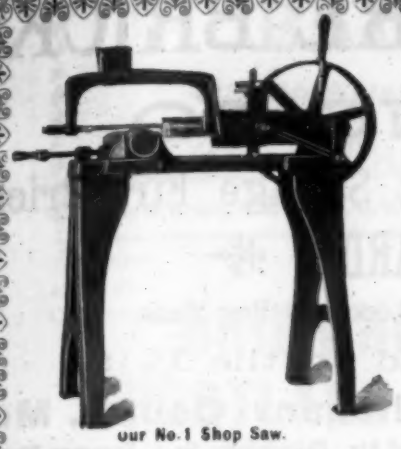

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THE Q AND C

Chicago.

New York.

estimated loss of $90,000, fully covered by insurance. The principal loss to the company will be in the length of time which it will take to rebuild the plant and equip it with the necessary machinery. The machinery which was destroyed was new and of the latest pattern, the mill having recently been refitted almost entirely. The building also contained the electrical and finishing departments, which were destroyed. General Superintendent J. M. Harris of the company estimates that it will be four months before the company can resume work.

The Benner Mfg. Co. has been incorporated at Chicago, with a capital stock of $5,000, to manufacture ornamental iron work, by Mathies Benner, John J. Fox and Mary Benner.

Illinois Steel Co.'s South Chicago mills turned out 1,318 tons of steel rails in 12 hours last week, which breaks the record, the previous mark for the same length of time being 1,310 tons, held by the same company.

The plant of the American Tin Plate Co. at Atlanta, Ind., was almost totally destroyed by fire Sept. 24. The shipping and trimming departments were entirely destroyed, and also stock worth $100,000. The total loss will reach $150,000.

D. S. McMullen, president of the McMullen woven wire fence factory, at Evanston, Ill., will sever his connection with that corporation Jan. 1. His successor, M. Chase, has already been appointed. The plant belongs now to the American Steel & Wire Co.

A large brass foundry is to be built at Lapham and Barclay streets by the Milwaukee Brass Mfg. Co. The firm will increase its force from 70 to over 100.

The Milwaukee Stove & Foundry Co., which is to operate a factory in the Kinnickinnic valley, at the foot of Hanover street, Milwaukee, has been incorporated with a capital of $25,000. The new foundry will give employment to 50 men at once.

D. E. & O. H. Postle have designed for the Illinois Iron & Bolt Co. an addition to its plant at Carpentersville. The building will be one story high and will extend over 75 x 132 feet. It will be spanned by seven large steel trusses and will cost $12,000. Construction has begun.

At the Silver King mill, Utah, where the owners have been experimenting with Wilfley tables, they are arranging to use Frue Vanners for the finer slimes. Five six-foot Frue Vanners have been ordered from Fraser & Chalmers, Chicago, after a satisfactory test of the six-foot Frue.

The Grand Crossing Tack Co. will build another addition to its plant on South Chicago avenue. It will be a pickling house, one story, 115x59 feet, and will cost $4,000.

General Industrial Notes:—

At Phœnixville, Pa., a large stack at the steel plant of the Phœnix Iron Co., 125 feet high and weighing about 50 tons, was successfully moved a distance of 15 feet Sept. 14 and set on a foundation. The stack is made of boiler iron and is 55 feet in diameter and lined from top to bottom with 4½-inch fire brick.

It is reported that the American Tin Plate Co. is preparing to concentrate plants, to save freights in the moving of products between the mills, and also to economize in the managing force and other operating expenses. The six mill Morton plant at Cambridge, O., will be dismantled and the machines moved to Martin's Ferry, O., and added to the 14-mill Laughlin plant. The Irondale plant of six mills, at Middletown, Ind., and the Montpelier, Ind., plant of equal size will probably be removed to Anderson, Ind. The Cumberland black plate plant, at Cumberland, Md., has been shut down and it is likely that it will be removed elsewhere.

The circular of President Osgood of the Colorado Fuel & Iron Co., on the increase in capital stock of $12,000,000, acted upon Sept. 25, says that it is proposed to apportion the increased capitalization as follows: For the improvement of the fuel department, $3,000,000, for the improvement of the iron department, $5,000,000; for auxiliary plants, $2,000,000; for working capital, $2,000,000. It is said that bids have already

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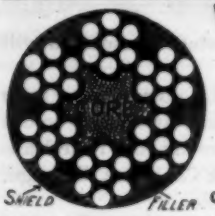

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been received for large blocks of the stock at prices above the present market value, but it is not proposed to sell all the stock at one time, but only to dispose of it as may be needed for the improvements contemplated. It is estimated that the consumption of iron and steel in the territory west of the Mississippi river amounts to about 2,000,000 tons per year. The present capacity of the works is not far from 150,000 tons per year, and it is to put itself in condition to more fully occupy its field that the proposition is made to increase its capital stock. With the improvements now in progress and contemplated, the output of the works will be nearly 600,000 tons per annum.

The Baltimore & Ohio Railroad has ordered 20 more compound consolidated freight locomotives from the Baldwin Locomotive Works. An order for 30 was placed earlier in the month and the 50 are to be delivered about Jan. 1.

The purchase of the patents on oil and gasoline stove appliances from the Dayton Mfg. Co. has been completed by H. B. Hunt and Chas. Adams, of Cleveland, who are interested in the National Vapor Stove Co., of Lorain, O. The latter company will require an addition to its plant to handle the new line.

The Pennsylvania Foundry & Mfg Co, of Pittsburg, has been reorganized at Akron, O., with a capital of $100,000. It purchased the plant of the Buell Mfg. Co. and will immediately remove its works from Pittsburg to Akron.

The Victoria furnace of the Empire Steel & Iron Co. at Goshen Bridge, Va., blew in last week and is making a successful run. The Oxford Furnace of the same company at Oxford, N J., started this week, making 10 of the 11 furnaces of the Empire Steel & Iron Co. active producers.

The rolling mill at Muscatine, Ia., is being dismantled by the Republic Iron & Steel Co., and the machinery taken to other plants. The mill was in operation only a short time after it was built.

The Buffalo Charcoal Iron Co. has been organized at Buffalo by Frank B. Baird, president of the Union Iron Works, Buffalo; Henry J. Pierce, president of the Manhattan Spirits Co; C. R. Baird, of Philadelphia; N. B. Budd, of Wil-

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liamsport, Pa., manufacturer of wood alcohol; W. S Gray, of New York; Thomas Keery, of Hancock, and R. J Gaffney, of Bradford, Pa. The president of the company will be Frank W. Baird, and Henry J. Pierce will be vice-president and treasurer. The plant is to be located adjacent to the Union Iron Works, where a tract of eight acres has been secured. An Ohio furnace is to be moved to Buffalo, and it is expected that it can be blown in on March 1, 1900. It is stated that the plant will consume about 200 cars of charcoal a month, the charcoal coming from Pennsylvania by-product works.

The Lawrence Furnace Co., Culbertson, near Ironton, O., has refused an offer made by Col. H. A. Marting of $100,000 in cash for the Lawrence furnace property. The purchase would have carried with it some contracts for material, and in addition to the $100,000 the personal property was to be paid for at its appraised value, making in all about $110,000.

Hecla Furnace, near Ironton, O., has gone out of blast for lack of stock.

The Kelly nail mill at Ironton, O., made 1,306 kegs of wire nails in 22 hours last week.

The Vernon Iron Co., of Campbell, O., has been incorporated with a capital stock of $50,000. In addition to the incorporators—Col. J. H. Moulton, Henry S. Neal, H. C. Burr, J. Harry Moulton and Carl W. Moulton—B. M. Caldwell, of Wheeling, W. Va., and others holding local iron interests will be identified with the new company. The property acquired includes the old Mt. Vernon furnace, which was operated for 60 years, and blown out in 1895. There are 10,000 acres of coal, ore and limestone lands. The furnace will be rebuilt.

DIRECTORY

To the Iron and Steel Works of the United States for 1898.

PUBLISHED BY
THE AMERICAN IRON AND STEEL ASSOCIATION.

Thoroughly Revised. Price, Seven Dollars.

The American Iron and Steel Association has just completed a thorough revision of its Directory to the Iron and Steel Works of the United States, bringing down to April, 1898, a description of these works. It also contains a complete Directory to many leading industries which are large consumers of iron and steel. This edition, which is the fourteenth that has been issued, embraces more complete details of all the iron and steel works of the United States, and of industries which are large consumers of iron and steel, than any preceding edition. It retains all the old features of preceding editions and contains many new features.

In the edition for 1896 there was given for the first time a complete list of Malleable Iron Works in the United States, and to this new feature there are now added complete lists of the Rail Mills, Structural Mills, Steel Casting Works, Bolt, Nut and Rivet Works, Chain Works, Seamless Tube Works, and Riveted Pipe Works—all new features.

The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description of their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition. It contains a complete list of all the

Blast Furnaces,
Rolling Mills,
Bessemer Steel Works,
Open-Hearth Steel Works,
Crucible Steel Works,
Plate and Sheet Mills,
Rail Mills,
Structural Mills,
Steel Casting Works,
Cut-Nail Works,
Tin Plate Works,
Stamping Works,
Forges and Bloomaries,
Wire Rod and Wire Mills,
Wire Nail Works,
Iron and Steel Bridge Builders,
Iron and Steel Ship Builders,
Horse-Nail Works,
Locomotive Works,
Malleable Iron Works,
Cast Iron Pipe Works,
Cast Iron Soil and Plumbers' Pipe Works,
Wrought Iron, Wrought Steel and Riveted Pipe Works,
Seamless Tube Works,
Chain Works,
Bolt, Nut and Rivet Works,
Car Axle Works,
Car Wheel Works, and
Car Builders in the United States

ALSO A LIST OF THE

Iron and Steel Works in Canada and Mexico.

This edition of the Directory is an invaluable book of reference for all business men who wish to correspond with iron and steel manufacturers or with iron and steel consumers, forming, in every respect, a COMPLETE GUIDE to the iron and steel works of this country and to the principal works which consume iron and steel.

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James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge been issued in this or any other country."

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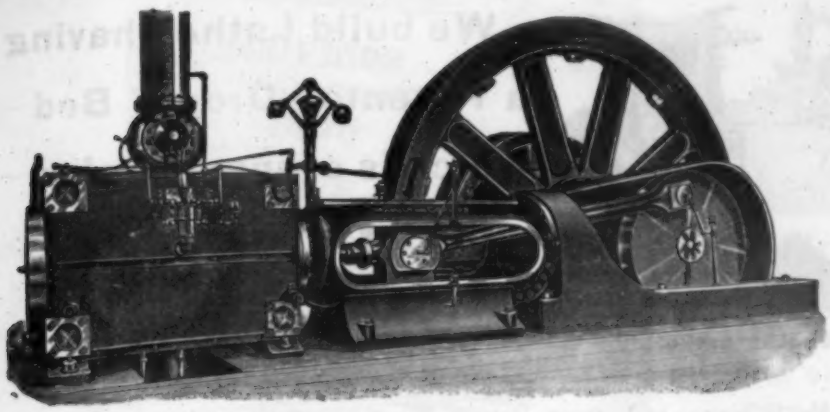

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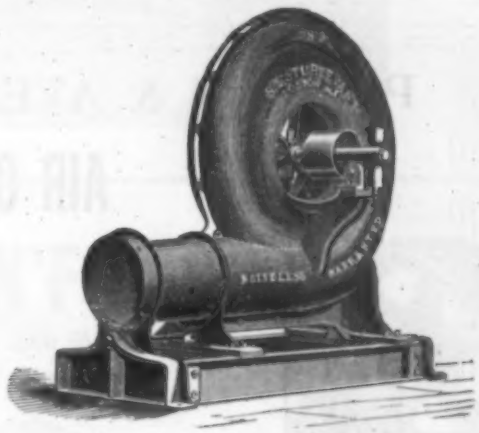

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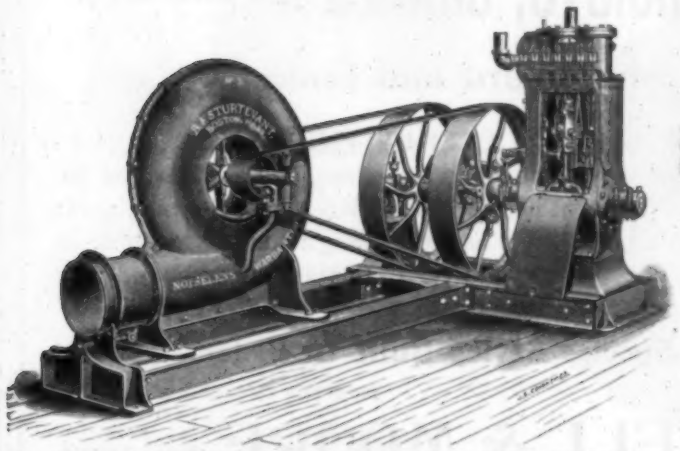

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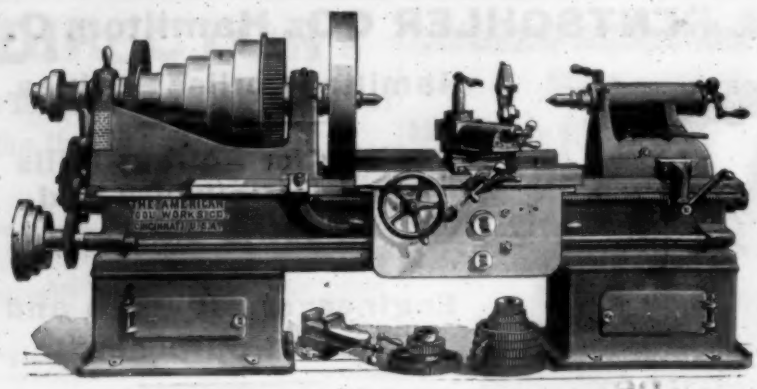

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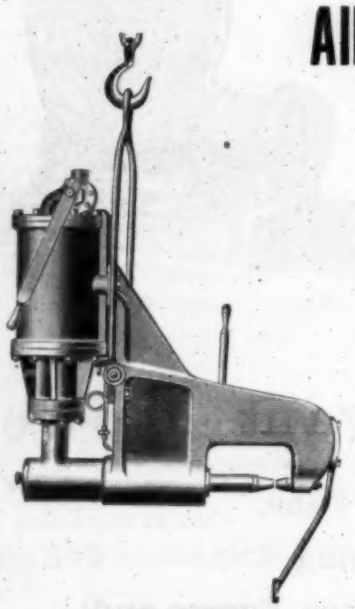

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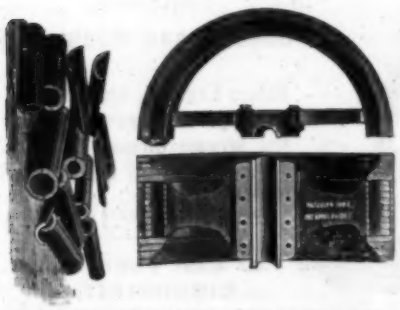

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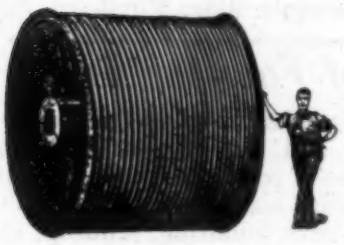

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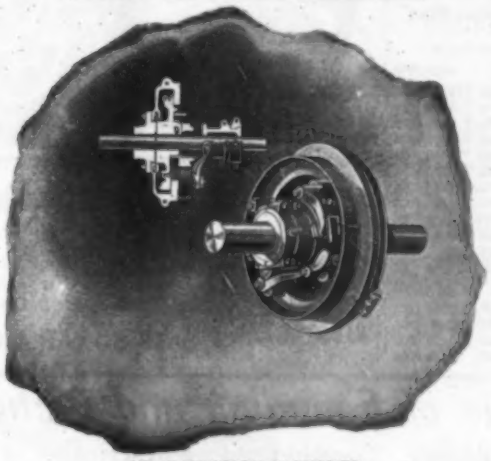

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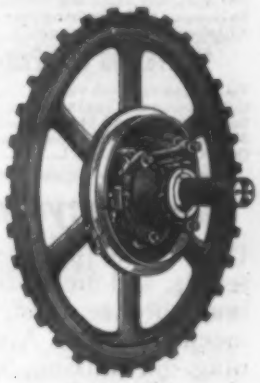

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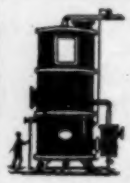

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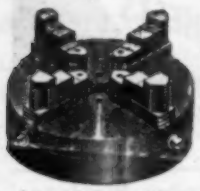

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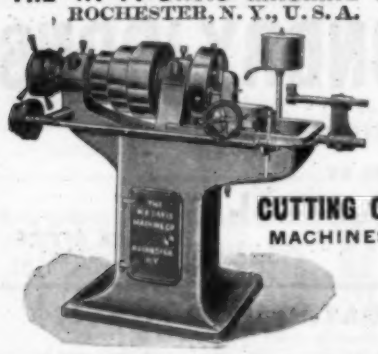

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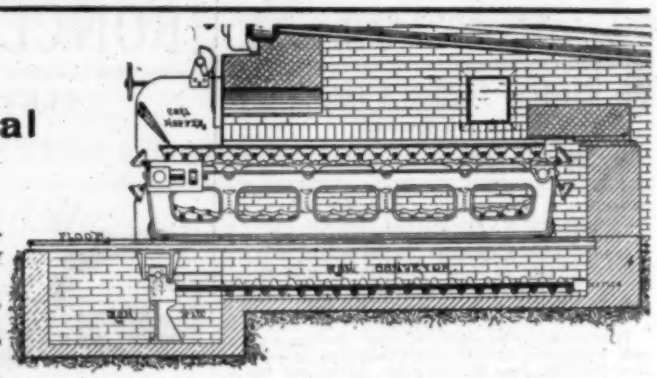

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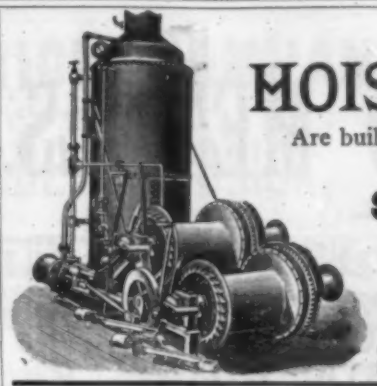

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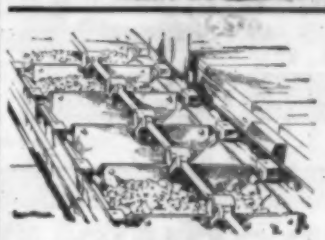

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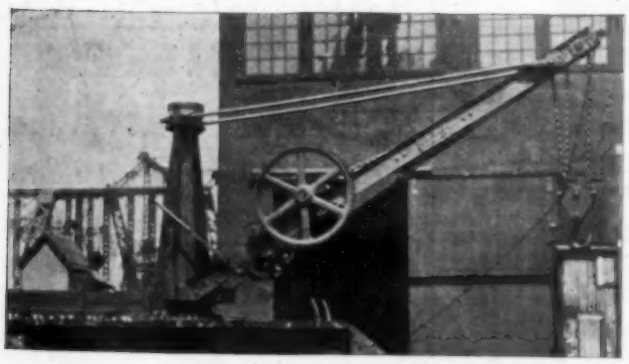

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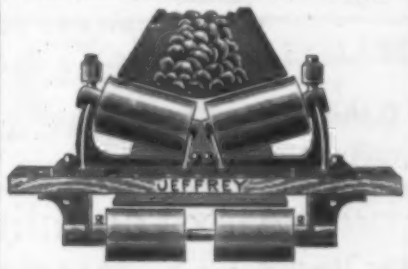

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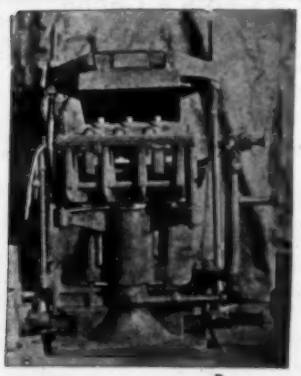

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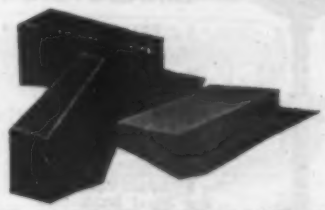

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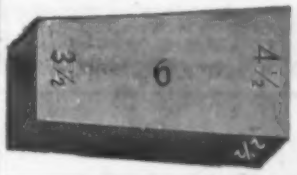

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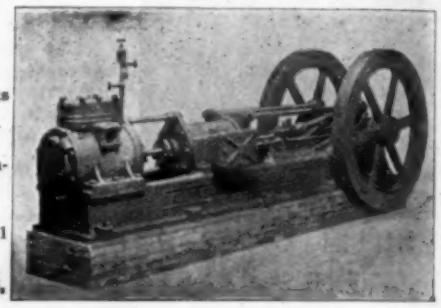

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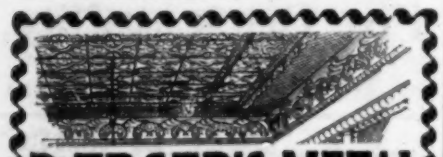

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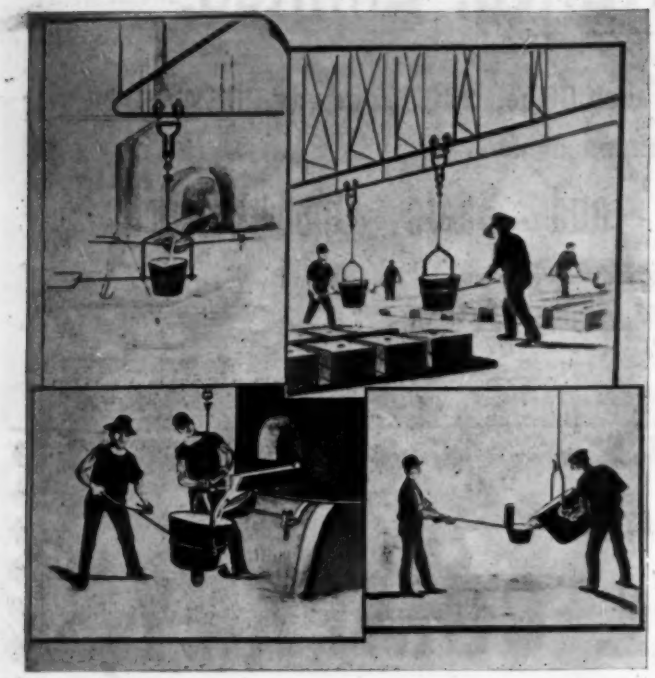

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Carnegie Steel Company, Ltd., Pittsburg (Lucy)	2	800	Double.
Struthers Furnace Company, Struthers, O.	1	301	Single.
Laughlin & Co., Ltd., Pittsburg, Pa. (Eliza)	5	2,000	Double (2).
Oliver & Snyder Steel Company, Pittsburg, Pa. (Edith)	1	400	Double.
Oliver & Snyder Steel Company, New Castle, Pa. (Rosena)	1	500	Double.
Shenango Valley Steel Company, New Cast'e, Pa.	2	800	Double.
Bellaire Steel Company, Bellaire, O.	2	700	Double.
Lebanon Furnaces, Lebanon, O.	2	500	Double.
Tennessee Coal, Iron & Railroad Company, Ensley, Ala.	4	800	Double.
Riverside Iron Works, Wheeling, W. Va	2	700	Double.
American Steel & Wire Co.	7	3,000	Double (3)
Totals	46	17,700	

For particulars write

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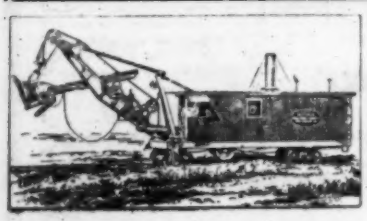
Uehling Method

is covered by U. S. patents Nos. 548,146, 629,480 and 632,031, which are fundamental, and others are pending.

The use of the Uehling Method at the furnaces mentioned has shown reduced labor cost, while **SANDLESS IRON** has proved a great advantage to the consumer.



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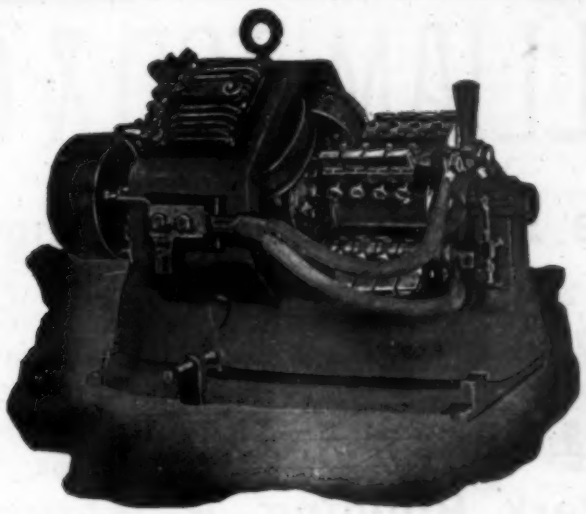

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Special low-phosphorus hard ore, Bessemer	$4.50
No. 1 Specular, Bessemer	$3.90@ 4.25
No. 1 Bessemer, hematite	3.00@ 4.05
Hematites No. 1 non-Bessemer	2.25@ 2.70
No. 1 Specular, non-Bessemer	2.50@ 7.75
Mesabi Bessemer	2.50@ .00

PIG IRON.

Cleveland (f. o. b. cars):

Bessemer	$23.25
No 1 Strong Foundry	$22 50@ 23.00
No. 2 Strong Foundry	21.50@ 22 50
Gray Forge, red short	20.50@ 21.00
No. 1 American Scotch	22.50@ 23.00
No 2 American Scotch	21.50@ 22.50
Lake Superior Charcoal	24.00@ 25.00

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons.
Old iron rails	$24 00
Old steel rails (6 ft. and over)	18.50
Old steel rails (6 ft. and under)	19.50
Old car wheels	20.00
	Net Tons.
No. 1 R. R. wrought scrap	$19.00
Mill scrap	14 50
No. 1 Machine cast scrap	10.00
Iron axles	23.00
Axle turnings	13.00
Wrought turnings (free from cast)	10 50
Cast borings	9.50
Uncut wrought iron boilers	7 00
Steel boiler plates	12.00
Grate bars	9 00
Pipes and flues (clean)	12.50
Tank Iron	12.00
Hoop and band iron	9.00
Sheet iron	8.00
Wrought drillings	10.60
Malleable iron	13.00

STRUCTURAL MATERIAL.

Beams and channels (f. o. b. Cleveland)	2.35c
Angles	2.35@ 2.45c
Tees	2.45c
Universal plates	3.00c
Sheared plates	3.00c

MERCHANT IRON & STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares—Bar Iron.

1 to 1⅞	2.50 Base.
2 to 2⅞	.20 extra.
3 to 3⅞	.50 "
3⅝ to 4	.80 "
4⅛ to 4⅝	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6⅝	2.20 "
6⅝ to 7⅞	2.50 "
⅛ to ⅜	.10 "
⅜ to 11-16	.20 "
⅝ to 9-16	.30 "
7-16 to 15-32	.40 "
½ to 13-32	.50 "
5-16 to 1-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats—Bar Iron.

1⅛ to 4 x ⅛ to 1	1.05 Base
4⅛ to 6 x ⅛ to 1	.10 extra
6⅛ to 8 x ⅛ to 1	.60 "
8⅛ to 10 x ⅛ to 1	.80 "
1⅛ to 4 x 1 1-16 to 1⅛	.30 "
4⅛ to 6 x 1 1-16 to 1⅛	.40 "
6⅛ to 8 x 1 1-16 to 1⅛	.60 "
8⅛ to 10 x 1 1-16 to 1⅛	.90 "
2 to 4 x 1⅛ to 2	.50 "
4⅛ to 6 x 1⅛ to 2	.60 "
6⅛ to 8 x 1⅛ to 2	.80 "
8⅛ to 10 x 1⅛ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4⅛ to 6 x 2⅛ to 3	.80 "
6⅛ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1⅜ x ⅛ to 1	.10 "
1 to 1 1-16 x ⅛ to ⅜	.30 "
⅛ to 15-16 x ⅛ to ½	.40 "
⅝ to 11-16 x ⅛ to ½	.50 "
¼ to 9-16 x ⅛ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6⅛ to 6⅜ x ¼ to 5-16	.50 "
4⅛ to 6 x ¼ to 5-16	.30 "
1⅛ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30
⅛ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extr.
7 to 8 x Nos. 10, 11 and 12	1.00 "
6⅛ to 6⅜ x No. 9 to 3-16	.70 "
6⅛ to 6⅜ x Nos. 10, 11 and 12	.80 "
4⅛ to 6 x No. 9 to 3-16	.50 "
4⅛ to 6 x Nos. 10, 11 and 12	.60 "
1⅛ to 4 x No. 9 to 3-16	.40 "
1⅛ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "

7-16 to ½ x No. 9 to 3-16.....1.30 extra
7-16 to ½ x Nos. 10, 11 and 12.....1.40
½ x No. 9 to 3-16.....1.50
½ x Nos. 10, 11 and 12.....1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.....
Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1⅛.....40 extra
⅜ to 13-16.....50 "
⅜ to 11-16.....60 "
⅜ to 9-16.....80 "
⅜ to 7-16.....1.10 "
½ to 9-16 x 3-16.....1.00 "
½ to 11-16 x ⅜.....1.20 "

Half Oval and Half Round.

2¼ to 3.....60 extra
⅞ to 2.....50 "
⅝ to 13-16.....70 "
⅝ to 11-16.....90 "
⅝ to 9-16.....1.20 "
⅝ to 7-16.....2.50 "
5-16.....3.50 "
¼.....4.50 "

Half Ovals less than ¼ their width in thickness extra price.

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All sizes.....1 c. extra.
Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width in Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base. Extras.
1¼ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs
1 to 1¼,	" 7, 8, 9 or 3-16"	.10 "
1 to 1¼,	" 10, 11, 12 or ¼"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10, 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10, 11, 12 or ¼"	.45 "
½, Nos.	7, 8, 9 or 3-16"	.55 "
½, "	10, 11, 12 or ¼"	.60 "
⅜, "	7, 8, 9 or 3-16"	.75 "
7-16 "	10, 11, 12 or ¼"	.85 "
¼, "	7, 8, 9 or 3-16"	.95 "
¼, "	10, 11, 12 or ¼"	1.05

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.	
7-16 to 3	Nos. 13, 14, 15 and 16.....	1.60 Base Extras.
7-16 to 2,	" 17, 18, and 19.....	.05 per 100 lbs
7-16 to 2,	" 20	.10 "
7-16 to 2,	" 21	.15 "
7-16 to 1½,	" 22	.25 "
½ to 1½,	" 13, 14 and 15.....	.05 "
½ to 1½,	" 16, 17 and 18.....	.10 "
1¼ to 1⅜,	" 19 and 20.....	per 100 lbs.
1¼ to 1⅜,	" 21.....	.20 "
1¼ to 1⅜,	" 22.....	.30 "
15-16 and 1,	" 13, 14 and 15	"
15-16 and 1,	" 16, 17 and 18.....	.15 "
15-16 and 1,	" 19 and 20.....	.20 "
15-16 and 1,	" 21.....	.25 "
15-16 and 1,	" 22.....	.35 "
¾, Nos.	13, 14 and 15.....	.20 "
¾, "	16, 17 and 18.....	.25 "
¾, "	19 and 20.....	.30 "
¾, "	21.....	.35 "
¾, "	22.....	.45 "
¾ and 13-16 Nos.	13, 14 and 15	.30 "
¾ and 13-16 "	16, 17 and 18.....	.35 "
¾ and 13-16 "	19 and 20.....	.40 "
¾ and 13-16 "	21	.45 "
¾ and 13-16 "	22	.50 "
¾ and 13-16 "	23	.60 "
11-16, Nos.	13, 14 and 15.....	.35 "
11-16, "	16, 17 and 18.....	.40 "
11-16, "	19 and 20.....	.50 "
11-16, "	21.....	.60 "
11-16, "	22.....	.70 "
11-16, "	23.....	.80 "
⅝, Nos.	13, 14 and 15.....	.40 "
⅝, "	16, 17 and 18.....	.45 "
⅝, "	19 and 20.....	.55 "
⅝, "	21.....	.65 "
⅝, "	22.....	.75 "
⅝, "	23.....	.85 "
9-16, "	13, 14 and 15.....	.45 "
9-16, "	16, 17 and 18.....	.50 "
9-16, "	19 and 20.....	.60 "
9-16, "	21.....	.70 "
9-16, "	23.....	.80 "
9-16, "	23.....	.90 "
½, "	13, 14 and 15.....	.55 "
½, "	16, 17 and 18.....	.60 "
½, "	19 and 20.....	.70 "
½, "	21	.80 "
½, "	22.....	.90 "
½, "	23.....	1.00 "
7-16, "	13, 14 and 15.....	.80 "
7-16, "	16, 17 and 18.....	.90 "
7-16, "	19 and 20.....	1.00 "
⅜, "	13, 14 and 15.....	1.00 "
⅜, "	16, 17 and 18.....	1.10 "
⅜, "	19 and 20.....	1.20 "

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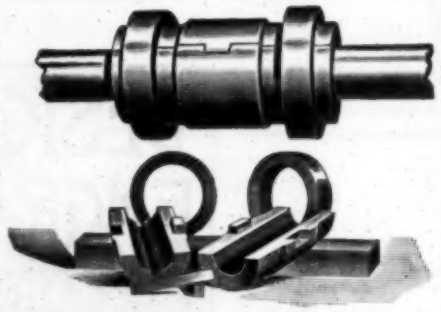

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Vulcan Mfg. Co., Pittsburg, Pa.

COMPRESSED AIR SHOP TOOLS—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
Q & C Co., Chicago, Ill.
American Pneumatic Tool Co., New York City.
Manning, Maxwell & Moore, New York City.

COMPRESSION COUPLINGS—
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.

CONTRACTORS FOR CLEANING BOILERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

CORE OVENS—
Millett Core Oven Co., Brightwood, Mass.

CORRUGATED IRON—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

COTTON TIES—
American Steel Hoop Co., Pittsburg, Pa.

CRANES AND DERRICKS—
Wm. Tod & Co., Youngstown, O.
Marion Steam Shovel Co., Marion, O.
Reading Crane & Hoist Works, Reading, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Brown Hoisting and Conveying Machine Co. Cleveland, Ohio.
Excelsior Iron Works Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

CUPOLAS—
Riter-Conley Mfg. Co., Pittsburg, Pa.

DIES—
Danielson Machine & Tool Co., Cleveland, O.

DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

DRILL GRINDERS—
J. Wendell Cole Columbus, O.

DRILL PRESSES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Manning, Maxwell & Moore, New York City.
Danielson Machine & Tool Co., Cleveland, O.

DROP FORGINGS—
Wyman & Gordon, Worcester, Mass.
Chicago Drop Forge & Foundry Co., Kensington, Ill.

DROP PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
R. Konigslow & Bro., Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield, Mass.

DRY KILNS—
B. F. Sturtevant Co., Boston, Mass.

DYNAMOS—
Jeffrey Mfg. Co., Columbus, O.

EAVE TROUGHS AND CONDUCTORS—
Berger Mfg. Co., Canton, O.

ELEVATING AND CONVEYING MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O.
Buhl Malleable Co., Detroit, Mich.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

EMERY AND CORUNDUM WHEELS—
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besley & Co., Chicago, Ill.
J. Wendell Cole, Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

EMERY WHEEL MACHINERY—
J. Wendell Cole, M.E., Columbus, O., or Chicago
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besly & Co., Chicago, Ill.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

ENGINEERS AND CONTRACTORS—
wellman-Seaver Engineering Co., Cleveland, O.
Walter Kennedy, Pittsburg Pa.
Heyl & Patterson Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, O
E. E. Erickson, Pittsburg, Pa.
John T. Jones & Co., Chicago, Ill.
Riter-ConleyMfg. Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Alex Laughlin & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.

ENGINE PACKING—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
American Tool Works Co., Cincinnati, O.

ENGINES (OIL)—
The Aultman Co., Canton, O.

ENGINES (STEAM)—
W. P. Davis Machine Co., Rochester, N. Y
Wm. Tod & Co., Youngstown, O.
B. F Sturtevant Co., Boston, Mass.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co, Hamilton, O.
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.
I. & E. Greenwald Co., Cincinnati, O.
Webster Camp & Lane Machine Co., Akron, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

ENGRAVERS AND ELECTROTYPERS—
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.,
Samuel R. Mason, Cleveland, O.

EXHAUST HEATING APPARATUS—
B. F. Sturtevant Co., Boston, Mass.

FANS—
B. F. Sturtevant Co., Boston, Mass.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

FILES, MAKERS OF—
C. H. Besly & Co., Chicago, Ill,

FIRE BRICK AND CLAY—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
F. B. Stevens, Detroit, Mich.
Chicago Fire Clay Product Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit. Mich.
Garden City Sand Co., Chicago, Ill
A. P. Smith & Co., New Brighton, Pa.

FIRE PROOF COVERING—
C. H. Besly & Co., Chicago, Ill.

FLEXIBLE SHAFTS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FLUE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Excelsior Iron Works Co., Cleveland, O.

FOUNDRY SUPPLIES—
Miller & Hays, Akron, O.
Clearfield Fire Brick Co., Clearfield, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. P. Smith & Co., New Brighton, Pa.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Millett Core Oven Co., Brightwood, Mass.
Cleveland Facing Mill Co., Cleveland. O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.
King Improved Sand Blast Co., Detroit, Mich.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FORGINGS—
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Braeburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.

FRICTION METAL—
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago, Ill.

FURNACES—
Playford Stoker Co., Cleveland, O.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FUEL OIL BURNERS—
W. S. Rockwell & Co., New York City.

GALVANIZED IRON—
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZERS—
Ætna-Standard Iron & Steel Co., Bridgeport, O
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GREASE—
A. F. Boettcher, Rowlands, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos Dixon Crucible Co., Jersey City, N. J.

GRATE BARS—
Geo. B Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HOISTS—
Reading Crane & Hoist Works, Reading, Pa.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

HEATING AND VENTILATING APPARATUS—
B. F. Sturtevant Co., Boston, Mass.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis
Lidgerwood Mfg. Co., New York City
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron O.
Excelsior Iron Works Co., Cleveland, O

HOISTING MACHINERY—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa
Jeffrey Mfg. Co., Columbus, O.
Excelsior Iron Works Co., Cleveland, O.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
Robins Conveying Belt Co., New York City.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

HOTELS—
United States Hotel Co., Cleveland, O.

IMPULSE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

IRON BUILDINGS—
Shiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.

IRON NAILS AND STEEL—
Bethlehem Steel Co., South Bethlehem, Pa
C. H. Besly & Co., Chicago, Ill.
F. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

IRON WORKING TOOLS—
American Tool Works Co., Cincinnati, O.
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Ball & Screw Co., Cleveland, O.
W. P. Davis Machine Co., Rochester, N. Y.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

LUBRICATORS—
A. F. Boettcher, Rowlands, Pa.

MACHINISTS' TOOLS AND SUPPLIES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Baush & Harris Machine Tool Co., Springfield, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
H. A. Streeter, Chicago, Ill.
Danielson Machine & Tool Co., Cleveland, O.

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Braeburn Steel Co., Braeburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.

MALLEABLE CASTINGS—
Acme Malleable Iron Works, Buffalo, N. Y.
Buhl Malleable Co., Detroit, Mich.

MANUFACTURING CHEMISTS—
We Fu Go Co., Cincinnati, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O
Republic Iron & Steel Co., Chicago Ill
Monongahela Iron & Steel Co., Pittsburg, Pa.

METAL BEARINGS—
C. H. Besly & Co. Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
Swarts Metal Refining Co., Chicago, Ills
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

ORE CARS—
The Pressed Steel Co. Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Co, Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers Chicago, Ill.

ORE SCREENS—
Seibel-Suesdorf Copper & Iron Mfg. Co., St. Louis, Mo.
Robt. Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
C. Wilford Peters, Cincinnat O.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland O

PERFORATED METALS—
Seibel-Suessdorf Copper & Iron Mfg. Co., St. Louis, Mo.
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.

PIG IRON—
R gers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill,

PIG IRON CASTING APPARATUS—
Heyl & Patterson, Pittsburg, Pa
G. H. Ginther, Special Agent, Pittsburg, Pa.

PIPE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

PIPE COVERING—
C. H Besly & Co., Chicago, Ill.
Jenkins Bros., New York City

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn.

PLANERS—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

PLATES—
Enterprise Boiler Co., Youngstown, O.
Republic Iron & Steel Co., Chcago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.

PNEUMATIC TOOLS—
American Pneumatic Tool Co., New York City
Q & C Co., Chicago, Ill.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.
Vulcan Mfg. Co., Pittsburg, Pa.

POWER DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield Mass.

POWER PRESSES—
Bertsch & Co., Cambridge City, Ind.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

POWER TRANSMISSON MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co. Chicago, Ill.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.

PULLEYS—
W. A. Jones Foundry Co., Chicago, Ill
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.

PUMPS (STEAM)—
The Edward P. Allis Co., Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill,
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.

PUNCHES—
E. Konigslow & Bro. Cleveland, O.

PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.

RIVETS—
Champion Rivet Co., Cleveland, O.
Jonse & Laughlins, Ltd., Pittsburg, Pa.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co. Youngstown, O.

ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

ROLLING MILL MACHINERY—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. B. Phillips' Sons Co., Philadelphia, Pa

ROOFS—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

SAND BLAST MACHINES—
King Improved Sand Blast Co., Detroit, Mich.

SAWS—
Peter Gerlach & Co., Cleveland, O.

SCREENS FOR COAL, ORE, ETC.—
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill

SCREW MACHINES—
Cleveland Ball & Screw Co., Cleveland, O.

SEAMLESS TUBES—
Shelby Steel Tube Co., Cleveland, O.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

SHAFTING—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa.
American Steel & Wire Co., Chicago, Ill.

SHAPERS—
W. P. Davis Machine Co., Rochester, N. Y.
Baush & Harris Machine Tool Co., Springfield, Mass.
American Tool Works Co., Cincinnati, O.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.

SHEET IRON—
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co, Bridgeport, O.
E. H. Stroud & Co., Chicago Ill.
Republic Iron & Steel Co., Chicago, Ill.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

SPECIAL MACHINERY—
American Tool Works Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.
Q & C Co., Chicago, Ill
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.

STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.

STEAM BOILER INSPECTORS—
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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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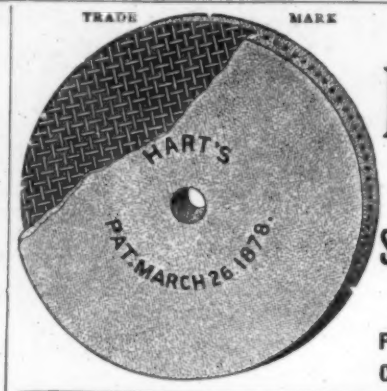

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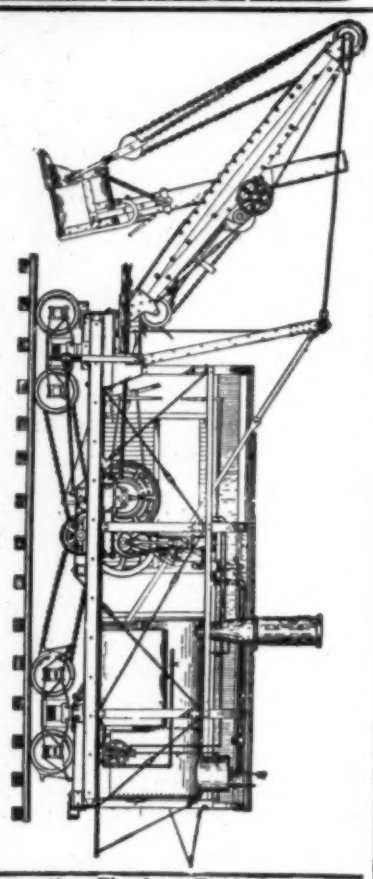

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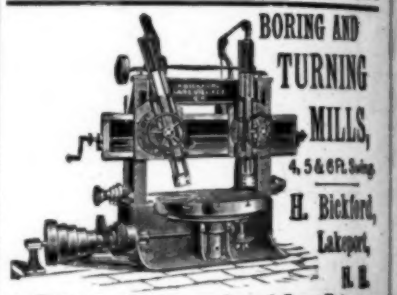

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